PROCEEDINGS

Royal Musical Association

Henry Chas Bannister

PROCEEDINGS

OF THE

MUSICAL ASSOCIATION

FOR THE INVESTIGATION AND
DISCUSSION OF SUBJECTS CONNECTED WITH THE
ART AND SCIENCE OF MUSIC.

FOUNDED MAY 29 1874.

FIFTH SESSION, 1878-79.

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RULES AND REGULATIONS

Passed at Three Special General Meetings of the Members, held at 27, Harley Street, W., on February 7 and April 3, 1876, and on January 6, 1879.

OBJECTS AND CONSTITUTION.

THIS ASSOCIATION is called the "MUSICAL ASSOCIATION," and is formed for the investigation and discussion of subjects connected with the Art, Science, and History of Music; and is intended to be similar in its organisation to existing Learned Societies.

It is not intended that the Association shall give concerts, or undertake any publications other than those of their own Proceedings, or the Papers read at their Meetings.

MEMBERS.

The Association shall consist of practical and theoretical musicians, as well as those whose researches have been directed to the science of acoustics, the history of the art, or other kindred subjects.

Any person desirous of being admitted into the Association must be proposed by two members.

Elections will take place by ballot of the members present at any of the ordinary meetings, and one adverse vote in four shall exclude.

No newly elected member shall be entitled to attend the meetings until the annual subscription be paid.

SUBSCRIPTION.

The annual subscription to the Association is one guinea, which shall become due on the 1st of November in each year.

Any member *may*, upon or at any time after election, become a life member of the Association by payment of a composition of £10 10s. in lieu of future annual subscriptions, but in addition to any Annual Subscription previously paid or due

from such member. Such sums shall from time to time be invested in legal security in the names of Trustees, to be appointed by the Council.

Should members desire to withdraw from the Association, they should give notice to the Hon. Sec. on or before the 31st of October.

MEETINGS

An ordinary meeting shall be held on the first Monday in every month, from November to June inclusive, at 5 P.M., when, after the despatch of ordinary business, Papers will be read and discussed.

An annual general meeting of members only shall be held at 4 P.M. on the last Monday in October, to receive and deliberate on the Report of the Council, and to elect the Council and officers for the ensuing year.

Special general meetings may be summoned whenever the Council may consider it necessary; and they shall be at all times bound to do so on receiving a requisition in writing from five members, specifying the nature of the business to be transacted. At least one week's notice of such special meeting shall be given by circular to every member, and ten members present at any general meeting shall constitute a quorum.

Every member shall have the privilege of introducing one visitor at the ordinary meetings, on writing the name in a book provided for that purpose, or sending a written order.

COMMUNICATIONS.

Papers proposed to be read at the meetings may treat of any subject connected with the Art, Science, or History of Music, Acoustics, and other kindred subjects.

Papers will be received from or through any member of the Association.

Experiments and performances may be introduced, when limited to the illustration of the Paper read.

All communications read will become thenceforth the property of the Association (unless there shall have been some previous arrangements to the contrary), and the Council may publish the same in any way and at any time they may think proper.

REPORTS.

A Report of the Proceedings of the Association, including the Papers read or abstracts of the same, and abstracts of the Discussions, shall be printed and distributed to the members as soon as possible after the end of each session.

This Report will be arranged and edited by the Honorary Secretary, under the direction of the Council.

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COUNCIL AND OFFICERS.

The management of the affairs of the Association shall be vested in a Council, to be elected by ballot at the general meeting of the members on the last Monday in October.

The Council shall consist of a President, Vice-Presidents, and ten ordinary members of the Association.

The Honorary Secretary of the Association shall be *ex officio* an ordinary member of Council.

The President, Vice-Presidents, Auditors, and five ordinary members of the Council shall retire every year, but shall be eligible for re-election.

At the annual general meeting in October, the Council shall present a balloting list, showing the names of the persons whom they propose for the offices of President, Vice-Presidents, and ordinary members of Council for the ensuing year. A copy of this list shall be given to each member present.

In voting, each member may erase any name or names from the balloting list, and may substitute the name or names of any other person or persons whom he considers eligible for each respective office; but the number of names on the list, after such erasure or substitution, must not exceed the number to be elected to the respective offices as above enumerated. Those lists which do not accord with these directions shall be rejected.

The Chairman of the meeting shall cause the balloting papers to be collected, and after they have been examined by himself and two scrutineers, to be appointed by the members, he shall report to the meeting the result of such examination, and shall then destroy the balloting papers. Auditors shall be appointed at the annual general meeting by the members, and the statement of accounts shall be sent by the Treasurer to the Auditors, and be remitted by them to the Secretary in time to enable the Council to judge of the prospects of the Association, and to prepare their report in accordance therewith.

The Council and officers shall meet as often as the business of the Association may require, and at every meeting three members of Council shall constitute a quorum.

ENACTMENT OR ALTERATION OF RULES AND REGULATIONS.

No rules and regulations can be enacted, altered, or rescinded, except at a special meeting of members summoned for the express purpose, the summons stating distinctly and fully the matter to be brought under consideration.

MUSICAL ASSOCIATION

FOR THE INVESTIGATION AND DISCUSSION OF SUBJECTS CONNECTED WITH THE ART AND SCIENCE OF MUSIC.

FOUNDED MAY 29, 1874.

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FOURTH SESSION, 1877-78.

THE ANNUAL GENERAL MEETING of the Musical Association was held at No. 27, Harley Street, Cavendish Square, on Monday, 28th of October, 1878.

IN THE CHAIR—W. H. CUMMINGS, ESQ.

THE FOLLOWING

REPORT OF THE COUNCIL

Was read by the Honorary Secretary.

IN presenting the Annual Report at the close of the Fourth Session of the Musical Association, the Council has the satisfaction of congratulating the members on the continued prosperity and increasing influence and recognition of the Society.

The fourth volume of the Proceedings has been sent to all members. It contains a series of highly interesting papers and discussions.

The arrangements for the past Session were as follow:—

First Meeting.—Monday, November 5, 1877. Paper by William Chappell, Esq., F.S.A., "Music a Science of Numbers."

Second Meeting.—Monday, December 3. Paper by W. H. Cummings, Esq., "On the Formation of a National Musical Library."

Third Meeting.—Monday, January 7, 1878. Paper by J. Spencer Curwen, Esq., "On the Laws of Musical Expression, as formulated by M. Lussy in his *Traité de l'Expression Musicale*." (*Illustrated on the Pianoforte.*)

Fourth Meeting.—Monday, February 4. Paper by the Rev. T. Helmore, M.A., "Suggestions for a more Expeditious Mode of writing the Time-Notes in Music."

Fifth Meeting.—Monday, March 4. Paper by W. J. Blaikley, Esq., "On a Point in the Theory of Brass Instruments."

Sixth Meeting.—Monday, April 1. (1.) Paper by George Bullen, Esq., "On the Galin-Paris-Chevé Method of Teaching considered as a Basis of Musical Education." (2.) Communication from Arthur Hill, Esq., B.E. (Queen's Coll., Ireland), "On a Suggested Improvement in Staff Notation for Vocal Music." (*Illustrated by Specimens.*)

Seventh Meeting.—Monday, May 6. Paper by Alfred Rhodes, Esq., "On a Practical Method for Reading Harmony."

Eighth Meeting.—Monday, June 3. Paper by Chas. Mackeson, Esq., F.S.S., "On the Present Cultivation of Sacred Music in England."

At the close of the paper "On the Formation of a National Musical Library," read by W. H. Cummings, Esq., an important discussion and interchange of opinion among those present led to a resolution proposed by Major Crawford, seconded by Otto Goldschmidt, Esq., and carried unanimously,—

That the Council be requested to prepare a Memorial to the Trustees of the British Museum calling their attention to the want of an index catalogue or other means of more ready reference than at present exists, and to the deficiencies and imperfections of the collection of manuscript and printed music and musical literature in the Museum; such Memorial to be submitted for signature to the various recognised Musical Institutions.

In accordance with the above resolution your Council prepared the following Memorial, which was signed by a large number of leading professional and amateur musicians, and was forwarded to the Trustees of the British Museum:—

TO THE RIGHT REVEREND AND THE RIGHT HONOURABLE THE TRUSTEES OF THE BRITISH MUSEUM.

We, the undersigned, desire respectfully to call the attention of the Trustees to the present condition of the musical collection in the Library of the British Museum

It is scarcely necessary to point out the importance of all that appertains to the art and science of music, and how enormously that art has risen in general estimation in recent years; but your memorialists feel that the national collection is not so complete and comprehensive as it might be; and that the arrangements in connection therewith, and the facilities for studying the same, have not kept pace with the constant advance and interest of the general public and the pressing necessities of students Your memorialists venture respectfully to suggest that it would be a great convenience to students—

(1.) If the collection of music and musical literature were made more complete than at present

(2.) If a special and separate catalogue of music and musical literature, both printed and in manuscript, were prepared

(3.) If in addition this catalogue could be printed and sold, as was the case with that of the manuscript music prepared by Mr. Thomas Oliphant in 1842.

The reply to this Memorial was by letter addressed to your Honorary Secretary:—

SIR, *June 24, 1878.*

I have had the honour to lay before the Trustees of the British Museum your letter of the 28th ult., and the memorial which you forwarded to me therewith from the Musical Association; also printed copies of a Paper read before the Musical Association in December last by Mr W. H. Cummings. The Trustees have directed me to acquaint you for the information of the Musical Association, that for some years past great efforts have been made to improve and enlarge the collections of music and musical literature, both printed and manuscript, in the British Museum, and that very considerable additions have in fact been made to those collections, that there has been for many years past a separate catalogue of music which comprises 372 volumes, two cataloguers and two copyists being employed thereon, and at least two thousand new entries being made annually.

I may add, all music received in the Museum is made available for readers within one week of its receipt; and that every assistance is afforded to students in their researches.

In regard to the proposal of the memorialists that a catalogue of music and musical literature should be printed, I am to acquaint you that the Trustees feel that they must postpone the consideration of this subject.

I have the honour to be, Sir, your obedient servant,

(Signed) J. WINTER JONES.

JAMES HIGGS, Esq.,
Hon. Sec., Musical Association.

The Council of the Musical Association rejoice in being the medium for giving publicity to the official statement as to the present facilities enjoyed by musical students, as they feel that such facilities are far in advance of the personal experience of many at a not very remote period. The Council still hope, and recent public statements justify the hope, that the Trustees may be able to grant before long those further facilities for which the Memorial prayed.

The accounts and balance-sheet have been made up and audited, and although but a small cash balance is shown, the Council have the satisfaction of knowing that, when the arrears of subscriptions for the passing financial year are received, the annual expenses will be well within the annual income.

The suggestion has been made, by those whose opinion the Council feels is entitled to much weight, that the Musical Association should, like many other kindred bodies, permit the annual subscription to be compounded by the payment of one lump sum; and as this would involve an alteration of the existing law as to the payment of subscriptions, an expression of opinion is invited by the Council at this meeting from those who feel interested in the subject. The existing law is—

The annual subscription to the Association is one guinea, which shall become due on the 1st of November in each year.

By the rules of the Association the President, Vice-President, and Auditors, and five of the ordinary members of the Council, retire each year, but all or any of them are eligible for re-election. The vacancies thus created will have to be filled up according to the regulations in that behalf, and a balloting list in the prescribed form will be put into your hands. It is proposed that Dr. Stainer, hitherto an ordinary member of the Council, should be enrolled among the Vice-Presidents.

The date of the annual general meeting being fixed by rule so close upon the commencement of the new Session, the outgoing Council have been obliged to make some preparation for the programme of the ensuing Session, with which view they have accepted the kind offer of Shelford Bidwell, Esq., M.A., to read a Paper on November 4, "On Recent Inventions for reproducing the Sound of the Human Voice," and have made other provisional arrangements which will be duly submitted to the new Council for its approval.

In conclusion the Council would remind you that at the last annual meeting it was their painful duty to announce the

retirement from office of Messrs. Charles K. Salaman and S. Arthur Chappell, the then Honorary Secretary and Treasurer of the Association. The loss of two such able officers called forth expressions of deep regret, but their retirement was seen to be inevitable, and it became necessary to take measures for supplying their places. With respect to the post of Treasurer, the Council were so fortunate as to obtain the immediate consent of Mr. Stanley Lucas to be nominated as Mr. Chappell's successor; and the Association congratulates itself on having secured and retained the valuable services of so efficient an officer. Greater difficulty was experienced in finding a new Honorary Secretary, and as no successor to Mr. Salaman could be nominated at the last general meeting, that gentleman, with his invariable kindness, consented to discharge the duties of his office *pro tem.*, for which the thanks of the Association are due to him. Eventually, however, your Council was so fortunate as to prevail upon Mr. James Higgs, Mus. Bac. Oxon., to undertake the unquestionably arduous duties of Honorary Secretary. Mr. Higgs' musical qualifications are well known, and were amply exhibited in his learned paper on "Bach's *Art of Fugue*," read before the Association, February 5, 1877; but musical ability is not the only qualification requisite for an efficient Honorary Secretary, and your Council gladly expresses its unanimous opinion that for administrative power, allied with tact and courtesy, Mr. Higgs has proved himself not less distinguished than for his musical learning.

The adoption of the Report was moved by W. Ellis, Esq., and being seconded by E. Prout, Esq., was carried unanimously.

A short conversation followed on the subject of compounding for annual subscription, and resulted in several members present signing the necessary requisition for a special meeting to alter the law, as suggested.

The President and Vice-Presidents were re-elected, Dr. Stainer being included among the Vice-Presidents.

The retiring members of Council were Messrs. Barrett, Bennett, Bosanquet, Monk, and Stainer. The elected members of Council were Major G. A. Crawford, the Rev. T. Helmore, and Messrs. Bosanquet, Higgs, and Monk.

The best thanks of the Association were, on the motion of E. Prout, Esq., seconded by J. D. Blaikley, given to the President, Vice-Presidents, and members of Council for their services during the past year.

Thanks were also awarded to the Honorary Secretary, on the motion of C. E. Stephens, Esq., seconded by A. D. Prendergast, Esq., and also to the Treasurer, on the motion of W. Chappell, Esq., seconded by A. J. Littleton, Esq.

A vote of thanks to the Chairman closed the meeting.

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SESSIONAL ARRANGEMENTS.

FIFTH SESSION, 1878–79.

First Meeting.—Monday, November 4, 1878.

Paper by SHELFORD BIDWELL, Esq., M.A., LL.B., "On Recent Inventions for reproducing the Sound of the Human Voice." (*Illustrated by the Telephone, Microphone, and Phonograph.*)

Second Meeting.—Monday, December 2.

Papers by LORD RAYLEIGH, M.A., F.R.S. (1.) "On the Determination of Absolute Pitch by the Common Harmonium." (2.) "On the Mutual Influence of Two Sounds nearly in Unison."

Third Meeting.—Monday, January 6, 1879.

Paper by E. PROUT, Esq., B.A., "On the Growth of the Modern Orchestra during the Past Century."

Fourth Meeting.—Monday, February 3.

Paper by G. A. OSBORNE, Esq., "Berlioz."

Fifth Meeting.—Monday, March 3.

Paper by the Rev. Sir F. A. GORE OUSELEY, Bart., M.A., Mus. Doc., "On the Early Italian and Spanish Treatises on Counterpoint and Harmony."

Sixth Meeting.—Monday, April 7.

Paper by C. G. SAUNDERS, Esq., "On the Construction of Buildings considered with Reference to Sound."

Seventh Meeting.—Monday, May 5.

Paper by W. SPOTTISWOODE, Esq., M.A., LL.D., P.R.S., "On Beats and Combination Tones."

Eighth Meeting.—Monday, June 2.

Paper by C. E. STEPHENS, Esq., "On Form in Musical Composition."

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November 4, 1878

G. A. MACFARREN, Esq., M.A., Mus. Doc.,
Vice-President, in the Chair.

THE RECENT INVENTIONS FOR REPRODUCING THE SOUND OF THE HUMAN VOICE.

By Shelford Bidwell, M.A., LL.B.

Not much more than a year ago the world was startled by the announcement of Professor Graham Bell's marvellous invention—the electric telephone—which rendered it possible to talk by telegraph.

The successful solution of a problem which had hitherto baffled all attempts excited universal interest, and has had the effect of directing considerable attention to the science of acoustics, particularly to that part of the subject which relates to the human voice.

The telephone has been followed by the discovery of other means of artificially producing articulate speech, and among the latest instruments devised for this purpose may be mentioned the phonograph, the microphone, and the aerophone. Of the last-named instrument we at present know little, except that it is said to be capable of imparting articulation to the sound of a steam-whistle. By its means, therefore, words may be uttered (so to speak) with such power as to be audible at a distance of several miles. No specimen of this instrument, nor any details as to its construction, have yet reached us from America. Our attention will therefore be confined this evening to the consideration of the telephone, the microphone, and the phonograph.

I need not remind you that all sound is primarily due to vibration. Sometimes the vibratory origin of a sound can be clearly distinguished by the eye. Thus, if you strike a tuning-fork and hold it up to the light you will see that so long as it gives out any considerable sound the outlines of the prongs are hazy and badly defined. This is, of course, owing to their rapid to-and-fro motion. The same thing will be observed if you pluck a stretched string or strike a bell. Many sounds, however, such as those of a whistle or an organ-pipe are caused by the vibration of a body of air, and since air is in-

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visible its vibratory motions are of course not apparent, but their existence can frequently be detected by the sense of touch. Now, all sonorous bodies with which we have to do are surrounded by air, and air is the medium through which sound is conveyed across the intervening space to the organs of hearing. When we remember that air is not really a uniform homogeneous mass, but is made up of an almost infinite number of little particles very near to each other, but prevented by certain repulsive forces inherent in them from actually touching, the theory of the transmission of sound becomes easily intelligible. It is shortly and simply this: The vibrating sonorous body communicates its vibrations to the particles of air in immediate proximity to it: these vibrations are then passed on from particle to particle of air, each one communicating its motion to its neighbours, until at last the wave of motion reaches certain particles which are in contact with a delicate drum-like membrane within the ear. Their impact against this sensitive organ produces certain physiological effects which result in the well-known sensation of sound.

The nature of the vibratory motions performed by every link in the chain of air-particles, from its origin to its termination, will depend upon those of the sounding body. If the vibrations of the sounding body are rapid, all the air-particles, from the first to the last, will vibrate with equal rapidity. If the rate at which the sounding body vibrates is slow, the air-particles will perform their vibrations at a corresponding slow rate. Again, the amplitudes of the vibrations performed by the air-particles will be large or small in correspondence with those of the sounding body, though it must be observed that inasmuch as each particle gives up its motion not to one only of its neighbours, but to several, among which it is equally divided, the length of the swing performed by any individual particle will decrease rapidly as the distance from the origin of the sound increases.

Every sound has three distinguishing characteristics—pitch, intensity, and quality. The first depends upon the rate of the vibration, slow vibrations producing a sound of low pitch and rapid vibrations a sound of high pitch. The *intensity* of the sound is dependent upon the amplitude or length of the vibration: the sound will be loud or feeble according as the vibrations take place through a large space or a small one. The *quality* of a sound is that characteristic which enables us to distinguish one *kind* of sound from another. Every one knows the difference between the sound of a flute and that of a violin. Every one recognises a distinction between the sound *ah* and the sound *oh*, even though both may be of the same pitch and the same loudness. Between all the various vowel sounds there is a well-marked and unmistakable difference. But

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though we are all quite conscious of such differences, we are unable without special education to say what is their exact nature. This matter, which was for a long time an incomprehensible mystery, the object of vague guesses and ingenious speculations, is now thoroughly understood; and it is to the complete explanation of it by Helmholtz that the telephone and the phonograph owe their existence.

To render this explanation clear it will be convenient to make use of a ball suspended by a string, forming a simple pendulum. Upon consideration you will see that the oscillations of a pendulum might have one other distinctive characteristic besides the rate at which they are performed, and the distance which they traverse. You will observe that the velocity at which the ball moves between the extreme limits of its course is variable. In the middle of its course it is rapid, then the speed gradually diminishes until the ball stops altogether. Instantly it resumes its journey in the opposite direction, slowly at first, but steadily increasing in pace until it attains the middle point, when once more its speed is diminished and the whole process is repeated.

Though from mechanical necessity this is invariably the kind of motion which is performed by a pendulum—rapid in the middle, slow at the two extremes—there is, of course, no reason why the motion of a particle between two extreme points might not possibly vary in any conceivable manner, while still the period of each complete oscillation remained unaltered. The particle might, for instance, travel quickly at the extremities of its journey, and slowly in the middle; or its course might be broken up into unequal portions, some of which might be performed quickly, others slowly. In fact, the conceivable variety is infinite.

Now it has been ascertained that the air-particles when conveying sound do not, except in very rare instances, perform the simple oscillations of a pendulum; their vibrations are generally of the most complex description, and it is upon the particular form of the vibration that the *quality* of the sound depends.

Several instruments have been devised for giving graphical representations of these vibrations, the best known of which is Scott's Phonautograph. In this instrument the sound to be examined is concentrated upon a small drum of india rubber or goldbeater's-skin, to the centre of which is connected a long and light strip of wood having a point at the end. The air-waves beat upon the drum and cause it to vibrate in exactly the same manner as the particles of air themselves; the vibrations of the drum are communicated to the strip of wood, causing the pointed end of it to perform the same motions on a larger scale. If now a piece of smoked glass or paper is drawn under the vibrating point, a peculiar wave-like curve

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will be traced upon it, the exact form of which will depend upon the nature of the vibrations.

I have here an enlargement of some tracings which were obtained in this manner. The first is the simple sinuous curve produced by a pure musical sound; the air-particles in this case performed motions exactly like those of an ordinary pendulum. The others were produced by singing into the instrument the vowel sounds *oo*, *o* and *a* in succession, care being taken that the sound was in each case of the same pitch and as nearly as possible of the same loudness. You will see that they are all more or less complicated in form and that each of them possesses a well-defined character peculiar to itself. When the conditions are unaltered, the same sound always produces the same curve, and the curves traced by two different sounds are never alike.

In order to ascertain from such curves what was the exact nature of the motions of the air-particles concerned in producing them, we must eliminate that component part of them which is due to the motion of the smoked glass or paper. Knowing the velocity at which the glass or paper moved, this is a problem which may be solved by a simple geometrical method. Without troubling you with the details of the process, I will exhibit by way of example what may be called a translation of the first two of these hieroglyphics—those produced by the pure musical tone and by the vowel sound *oo*.

Upon the screen is projected a spot of light which is intended to represent a particle of air. By means of a suitable mechanical arrangement there is imparted to it a motion of the kind denoted by the hieroglyphic which was traced by the pure musical tone. It is, as you will have foreseen, a simple backward and forward oscillation, rapid in the middle and slow at the two extremes, like that of a pendulum. I now substitute an arrangement intended to interpret the hieroglyphic corresponding to the sound *oo*. The motion of the spot of light is in this case of a totally different character. There is no longer a gradual acceleration as the spot approaches the middle of its course, and a gradual retardation towards the two ends. It appears to be governed by no law whatever, sometimes starting forward with a jerk, then suddenly slackening and even moving in a retrograde direction more than once in the course of its oscillation. This is a very fair imitation on a large scale and at a reduced speed of the movements performed by every particle of air which assisted in conveying the sound of that vowel *oo*.

All other vowel sounds excite in the air-particles vibrations which are equally irregular in appearance, though their details are in every case more or less varied.

The cause of the complexity of these motions is very shortly this. No sound, with perhaps the single exception

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of that of a tuning-fork when excited in a particular manner, is a *simple* one. What we are accustomed to regard as simple elementary sounds are in fact more or less complicated *chords*. The fundamental note is always accompanied by other higher notes of varying pitch and intensity, and it is the admixture of these higher notes which determines the character or quality of the sound. Were the higher notes or "overtones" to be in every case eliminated, we should be unable, as Professor Tyndall tells us, to distinguish the sound of a clarinet from that of a flute, or the sound of a violin from either. All voices would be exactly alike, and no distinction between the various vowel sounds would be recognisable. In short, we should be universally afflicted with an incapacity closely analogous to colour-blindness, quality—or "clang-tint" as it is sometimes called—being to sound very much what colour is to light. The human voice is very rich in overtones, as many as eighteen having been distinguished in certain cases. Such overtones are always present when the voice leaves the larynx, but in comparison with the fundamental tone, they are generally weak. We have however the power of bringing one or more of them into greater prominence than the others, by merely altering the form of the cavity of the mouth, so as to reinforce by resonance the particular overtone or overtones necessary for the quality of the sound which we desire to utter.

If I strike a tuning-fork and hold it up in the air, the sound which it emits is so weak that it cannot be heard at any distance. I now hold it over the end of a brass tube, the capacity of which can be altered by dipping it into a vessel of water, and you will observe that when the empty portion of the tube is of one particular length, the intensity of the sound is so much increased that it may be heard all over the room. If the capacity of the tube is either increased or diminished, the sound at once becomes weaker. To reinforce the sound of a tuning-fork of a different pitch, it would be necessary to immerse the tube up to a different but equally definite point; and if we had two or more tuning-forks all vibrating at once over the mouth of the tube, we might reinforce the sound of any one of them which we chose to select, by simply immersing the tube to the proper depth.

In the same sort of way we are able to select and, by suitably adjusting the cavity of the mouth, to reinforce any one or more of the overtones which are present in the voice, and this process, though unconsciously performed, is rendered by long practice easy and certain.

A, then, is a chord; *e* is another different chord; the other vowel sounds are others. Helmholtz has determined the constituent notes of every vowel sound of a certain pitch, and by properly exciting sets of tuning-forks corresponding to those

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notes, he has succeeded in obtaining from them the sounds of all the vowels.

Now each single note in these chords is itself a pure musical tone, and if acting alone, would produce in the air-particles simple vibrations, like those of a pendulum. But when several such notes of different pitch and different loudness exist at the same time, each of them will tend to make the particles move in a different manner; and under the combined influence of these several acts of forces, all tending to produce a different motion, the particles will perform the complicated vibrations denoted by the curves which you have seen.

This then is the method in which vibrations corresponding to vowel sounds are produced by the human voice, and no instrument can be made to imitate the voice which is not capable of producing, by direct or indirect means, vibrations of a precisely similar character.

In the earlier attempts at constructing an electric telephone sufficient attention was not paid to this point, and it was endeavoured to reproduce the sounds of the voice by simply exciting at the distant end of a telegraph wire a series of vibrations resembling in *period* only those which acted upon the transmitting instrument, no regard whatever being had to the form of these vibrations. The result was that, though the tones of the voice were to a certain extent imitated, articulation was entirely absent. The best known of these instruments is that invented by Reiss, a specimen of which was to be seen in the Loan Exhibition of 1876.

A modified form of such a telephone is now before you. The transmitting instrument consists of a small drumhead of very thin iron which is electrically connected with one pole of a galvanic battery. About $\frac{1}{10}$-inch distant from its centre is the point of a carbon pencil to which the line-wire is connected. The receiving instrument contains a similar drumhead of iron, very near which is placed a small electro-magnet having one end of its coil joined to the line-wire coming from the carbon point, and the other end connected either directly or through the medium of the earth with the second pole of the battery.

When a note is sung at a short distance from the thin iron diaphragm of the transmitting instrument, the vibrating particles of air which convey the note communicate their vibrations to the iron, every single vibration bringing the iron into momentary contact with the carbon point. Now every contact between the iron and the carbon closes the electric circuit, thereby causing a momentary attractive power in the electro-magnet of the receiving telephone, and a consequent movement of the iron plate in that instrument. If we suppose that the note sung is that known to musicians as "middle C," the number of vibrations produced in a second will be 256; 256 currents of electricity will in the same time pass through

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the coil of the electro-magnet, and 256 to-and-fro movements will occur in the adjoining iron plate. The iron plate will thus become the origin of a new sound which will exactly correspond in pitch with the note—middle C—which we supposed to have been sung.

The great defect in this instrument as in all others constructed on a similar principle is its inability to reproduce the qualities of the sounds which it is intended to transmit. For this purpose it is clearly necessary that some other method should be adopted of supplying electricity to the electro-magnet in the receiving instrument than that of simply closing a galvanic circuit. For when that is done there can be no means of graduating the strength of the current, and thus causing the power of the electro-magnet to vary during each vibration in such a manner as to produce in the second diaphragm motions precisely corresponding with those of the air-particles. The instant that contact is made the full power of the electricity is brought into play: no sooner is contact broken, than in the twinkling of an eye all trace of electricity disappears. Between the maximum power of the electro-magnet and its minimum power there is no mean: at one moment it attracts the diaphragm with the utmost force of which it is capable, the next moment not at all: although, therefore, it can cause the diaphragm to vibrate, it is utterly incompetent to mould its vibrations into those delicate forms upon which the various qualities of sound depend for their distinctive characters.

After years of study and experiment Professor Bell at last succeeded in producing an instrument which perfectly fulfils all the necessary conditions. Beginning with a most complicated machine, which was intended to comform to certain theories enunciated by Helmholtz, Professor Bell gradually simplified, and at the same time improved his apparatus, until at length it attained the "ridiculously simple"* form which is now familiar to every one.

At the end of a trumpet-shaped wooden case is a funnel-like mouthpiece, immediately behind which is a disc of thin iron. Just so far away from the other side of the iron disc as not to interfere with its free vibration, is a bar-magnet, upon the end of which is mounted a small wooden bobbin, having a quantity of insulated copper-wire wound round it. The two ends of this wire are connected with brass binding screws for joining them on to the line-wires. In this arrangement the transmitting instrument and the receiving instrument are identical in form; in fact, it often happens that there is only one instrument at each end of the line, which serves the purposes both of a transmitter and of a receiver, being used in the manner of an ordinary speaking tube. The usual and more convenient

* Sir William Thomson.

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practice is to have two instruments at each end, one of which is applied to the mouth, and the other to the ear.

Now every deflection which the impact of sound-waves causes in the diaphragm of the transmitting instrument will induce in the coil of wire a momentary current of electricity, the strength of which will be proportional to the extent of the deflection. This current travelling along the line-wire will vary the attractive power of the magnet in the receiving instrument in a degree proportional to its strength; and, under the influence of this variation in the attractive power, the second diaphragm will undergo deflections similar in every respect except amplitude to those of the other. The vibrations thus set up will originate a new sound of the same pitch and character as that by which the transmitting instrument was excited, but it will be far less intense.

It will be noticed that with this apparatus no battery whatever is used, the electricity being generated simply by the action of the voice, which, by causing the diaphragm to vibrate, produces electric currents in the coil of wire. The original source of energy is therefore very small; and when we consider the number of transmutations which this energy undergoes before it reappears as sound, each transmutation involving an immense amount of waste, it is not surprising that the sound when reproduced should be extremely feeble. It has, in fact, been calculated that, with the best instruments and a short circuit, not more than $\frac{1}{1000}$ part of the original sound is given out by the receiving telephone.

Its deficiency in power is the one grave defect under which this otherwise nearly perfect instrument labours. Seated in solitary silence with the instrument applied closely to your ear, a conversation with a distant friend may be easily and comfortably carried on. But when persons are talking near you, when machinery is working, or carts and carriages are passing outside, it becomes extremely difficult to follow the telephonic communication, and if you should happen to remove the instrument a few inches away from your ear you will hear nothing at all.

No great improvement in this respect can be hoped for so long as we have no more powerful source of electricity than the mere sound of the voice. If, instead of relying upon the voice itself for the generation of the required energy, we could devise an instrument for enabling the voice to control and regulate the energy derived from another and more powerful origin, such as a galvanic battery, we should have a much more satisfactory telephone. By way of illustration, we may liken the ordinary Bell's telephone to a piano, and the more perfect telephone, yet to be invented, to an organ. In a piano the energy which produces the sound is derived solely and entirely from the fingers of the performer, and the amount of

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sound so generated is clearly limited by the performer's physical strength. A strong man could extract more sound from the instrument than a delicate young lady; but no ordinary human being could make a piano, of whatever construction, give out tones of very great power.

With the organ the case is different. The organist has nothing whatever to do with the generation of the sound-producing energy. This energy is supplied by another man, the blower, or sometimes by several men, and occasionally, as in the large instrument in the Albert Hall, by a steam-engine. The sole function of the organist is to control and regulate the flow of the energy which is supplied to him, so as to produce the desired musical effects, and he is thus enabled, with the least amount of physical effort, to fill with powerful strains of music such vast spaces as the Albert Hall or St. Paul's Cathedral, where the tinkling notes of a piano would be utterly lost.

What we desire is to construct a telephone on a similar principle, using a galvanic battery as a source of energy, and having a suitable regulating apparatus analogous to the key-board of the organ, to be acted upon by the voice, instead of by the fingers. If this could be done there would be hardly any limit to the loudness with which a telephonic message might be repeated. A mere whisper breathed into the transmitting instrument could, if necessary, be transformed by the receiver into a shout loud enough to be heard by a large assembly.

Until very lately no one thought that this would ever be done. It seemed absolutely impossible that the strength of direct battery currents could ever be regulated with sufficient delicacy to produce articulation. But a few months ago the first step towards the solution of the problem was taken by Professor Hughes. He has devised a little instrument even more "ridiculously simple" than the telephone, which by means of a battery current transmits articulate speech with great distinctness. This instrument, which has been named the *microphone*, is peculiarly sensitive as a transmitter of sound, being capable of conveying words which are spoken at a distance of several feet from it. At present, however, the sounds as reproduced at the distant station are little if any louder than with the older instrument; but since the invention is still in its earliest infancy we may reasonably look for great improvement.

A specimen of one form of the microphone is now before you. The essential parts of it are three small pieces of gas carbon, two of which are in the form of rectangular blocks, and are fixed one above the other on an upright board, the third being a little cylindrical pencil which is pointed at both ends and loosely pivoted in an upright position between the two blocks. To each carbon block a copper-wire is attached, and

the transmitting instrument is complete. For the rec[eiving] instrument an ordinary electro-magnet with a disc of thi[n] fixed before its poles may be used, but a telephone of Be[ll's] form is found to be far more sensitive.

A current of electricity from a battery is conveyed by m[eans] of a wire to the upper carbon block; thence it passes thro[ugh] the carbon pencil to the lower block, and thence along anot[her] wire to the distant telephone. The circuit is completed b[y a] wire connecting the telephone to the other pole of the batte[ry]. Thus, when everything is at rest, there will be a constant uniform current of electricity circulating through the microphone, the connecting wires, and the telephone. An ear applied at the telephone would now hear nothing, because, the stream of electricity being uniform, there would be nothing to distu[rb] the equilibrium of the thin iron disc. If, however, the resistance to the passage of the electric current were to be suddenly increased or diminished in any part of its course, a click would be heard in the telephone at the moment of such change. For the variation in the current would cause a corresponding variation in the attractive power of the telephone magnet, and a consequent movement of the iron disc. Now Professor Hughes has discovered that the resistance to the passage of an electric current presented by an arrangement of carbon blocks, like that before you, may be made to vary by extremely small causes. The mere impact of sound-waves upon the carbon pencil is sufficient to produce such variation; and more than that—the variation from one point of time to another will correspond precisely with the phase of the sound-wave, however complicated the wave may be. The apparatus is therefore suited to take the place of Bell's form of telephone for the transmission of articulate speech, one of Bell's telephones still being used as a receiver: but since the difference between the maximum and the minimum variation is not very great, the sounds heard at the receiving telephone will not be materially louder than with a pair of the original telephones connected in the usual manner.

The generally accepted explanation of the microphone is this: Increase of pressure, whether caused by the impact of an air-wave or otherwise, brings the carbon conductors into better contact, thus decreasing the electrical resistance. Diminution of pressure tends to separate the conductors, and so to increase the resistance to the passage of the electricity. It is probable, however, that the matter has not yet received its final explanation.

The most remarkable property of the microphone, and that from which it receives its name, is its extreme sensitiveness to the vibrations of very small sounds, particularly when they are excited by actual contact with the instrument. Thus when a feather is dropped upon the stand the unassisted ear cannot

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sour the slightest sound at the distance of a few inches. Yet phy. the assistance of a battery current and a telephone the fr of a feather can be distinctly heard many miles away. A or e tap with the finger-nail or a light touch with a camel's-str brush are magnified into very loud sounds, and under able conditions the footfall of a fly as it walks across the ne d is easily distinguished. Unfortunately, the sound pr not be heard by more than one person at a time, and the f vers of the instrument cannot therefore be exhibited to an audience.

A further advance towards perfection has been made in the carbon telephone of Mr. Edison. The principle of this instrument is exactly the same as that of the microphone, imperfect ntact being made between a button of carbon and a small c ac of platinum. The carbon is however attached to a somewhat stout diaphragm of iron, which exposes a larger area to the action of the sound-waves; and the whole arrangement is conveniently mounted in a case resembling that of Bell's instrument. Speech transmitted by one of these telephones is said to have been heard by several hundred persons at once.

We come now to the consideration of one of the most singular pieces of mechanism which has ever been contrived by human ingenuity—Mr. Edison's phonograph. Its object, like that of the telephone, is the reproduction of sound, and particularly of the complex articulate sound of the human voice. But the agency employed is purely mechanical: there is no electricity, no magnet, no galvanic battery; nothing but a comparatively simple arrangement of mechanism. By the telephone a sound is reproduced at sensibly the same instant when it occurs. The phonograph however can repeat words which have been spoken into it, at any subsequent period, it may be a hundred years later, and the words so stored up can be repeated by it, not once only, but as many as ten or even twenty times. But the phonograph accomplishes its object in the same kind of way as the telephone—by causing a stretched membrane to perform certain very complicated vibrations.

It will easily be seen that vibrations of a certain form may be caused by very simple mechanical means. Here is a piece of steel spring, which has a short point attached perpendicularly to one end. The spring is held at the other end, and a file is drawn across the point. Now, on the face of the file are a succession of little ridges and furrows, and these passing over the point cause the spring to vibrate. The *rate* of the vibrations so produced will depend upon the rate at which the file is moved; their *form* will depend upon the form of the ridges and furrows over which the point travels. Now, these vibrations of the spring stir up similar vibrations in the surrounding air, and produce a sound; but since the surface of the spring is small the number of air-particles exposed to its influence is

comparatively few, and the sound consequently feeble. In order to increase the vibrating area we connect the spring by a piece of twine to the centre of a small drum. If the spring is held so that the twine is taut, all the vibrations of the spring are communicated through the twine to the drum. This exposes a larger vibrating surface to the air, and the amount of sound produced on drawing the file across the point is much increased.

The outline of the ridges and furrows upon the face of the file would, if greatly magnified, be represented by a zigzag line something like the teeth of a saw. Suppose now that we were provided with a file having upon its face ridges and furrows whose outline, instead of being a simple zig-zag, resembled one of the sinuous lines which we saw just now—that corresponding to the vowel *oo*, for instance. When such a file was drawn over the point the resulting vibrations of the spring and drum would produce a noise as in the former case; but this noise, instead of being altogether inarticulate, would closely approximate to the vowel sound *oo*, because the vibrations stirred up in the air would be similar in form to those produced by the voice in saying "*oo*."

So too we might have a file cut in such a manner as to cause any other desired form of vibration, when drawn across the point. Sound of any quality whatever could thus be obtained, and if we wished to make the sound continuous, we might cut the proper ridges and furrows upon the surface of a grindstone, instead of upon the file, and the sound would continue as long as the handle of the grindstone was turned. Lastly, if we wished to produce not merely a continuous vowel sound, but a succession of words or even sentences, we might elongate our grindstone into a drumlike cylinder, and mount it upon a screwed spindle, so that at each turn a fresh surface might be exposed to the point. Ridges and furrows suited to produce sentences of considerable length might then be cut in a spiral line upon the cylinder, and we should have a very remarkable talking machine.

The only obstacle in the way of carrying out this idea is the utter impossibility of cutting such ridges and furrows with sufficient accuracy upon either a file, or a grindstone, or a cylinder.* This difficulty has been surmounted by the phonograph, which enables the voice itself to cut the proper ridges and furrows.

Here is a small brass cylinder mounted upon a screwed

* On the 27th of February, 1879, an instrument was exhibited to the Royal Society by Messrs. Preece and Strob, containing a series of small brass wheels, upon the peripheries of which were cut such indentations as above described: when these wheels were made to rotate successively under a spring connected with a diaphragm, all the vowel sounds were very accurately reproduced.

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axle, and having upon its surface a spiral groove of the same pitch as the screw on the axle. At a short distance from the cylinder and perpendicular to its surface is a steel point which is attached to a spring in the same way as the one which was used with the file. One end of the spring is fixed, the other is connected by a piece of silk or a rod of pine to the centre of a parchment drum. By means of a screw-nut we can bring the steel point up to the groove on the cylinder, and if we turn the handle the point may be made to travel in a spiral course from one end of the cylinder to the other without ever leaving the groove. Now if only the bottom of the groove were indented with suitable ridges and furrows, the point in passing over them might be caused to vibrate in such a manner as to produce the sound of any desired words. The way in which the exceedingly complex ridges and furrows necessary for this purpose are formed is wonderfully simple.

On the opposite side of the cylinder is the apparatus for doing it. This consists of a mouthpiece like that of a speaking tube, the object of which is to concentrate the sound of the voice upon the back of a stretched membrane, which is generally made of thin iron. Upon the other side of this membrane a short steel point is fixed perpendicularly. This point can, like the other, be brought into the groove on the cylinder, and be made to travel from end to end without leaving it. But before using the instrument, the cylinder is covered with a sheet of stout tinfoil, which prevents the point from entering freely into the groove. When the point is screwed up so as to press upon the tinfoil and the handle is turned, a smooth groove is scored upon the tinfoil, but if while the handle is being turned we say *oo* into the mouthpiece, the groove then formed will no longer be smooth, but will be indented with a succession of little undulations. The existence of these undulations is plainly visible to the unassisted eye, and if we could conveniently examine them with a microscope we should see that their outline very closely resembled the curve corresponding to *oo* which was traced by the phonautograph. The characters are in each instrument formed in precisely the same manner, the only difference being that whereas those of the phonautograph are traced upon a flat piece of glass or paper, those of the phonograph are embossed perpendicularly upon the yielding surface of a sheet of tinfoil.

The sounds spoken into the mouthpiece cause the iron membrane to vibrate in a particular manner, the nature of the vibrations depending upon the quality of the sound. The point of course vibrates with the membrane, and in so doing punches indentations upon the moving tinfoil against which it presses. Thus there is formed upon the cylinder a succession of little hills and valleys suitable for causing the spring on the other side to vibrate in such a manner as to reproduce

the original sound. Having withdrawn the point which made the indentations, I place the point of the spring at the beginning of the indented furrow and then turn the cylinder so that the indentations pass under the point; the spring is thereupon made to vibrate (just as it was by the file), its vibrations are communicated by the silk thread or wooden rod to the parchment drum, and by the parchment drum to the surrounding air: and a sound is produced which you will recognise as a feeble but evident reproduction of the sound *oo* which was originally spoken into the mouthpiece.

It is, of course, theoretically possible to use a single diaphragm both for the production of the indentations and the reproduction of the sound; and indeed many instruments have been constructed on this principle. But, for reasons which it is not difficult to imagine, the arrangement just described is found to give the best results.

The phonograph is not a perfect instrument, and from its nature probably never will be. The extremely delicate details of the vibrations upon which the distinctive quality of different sounds depends must necessarily be injuriously affected by the resistance of the tinfoil, which impedes the free vibration of the iron membrane.

But the invention is nevertheless a very marvellous one, and its articulation, though somewhat muffled and metallic, is generally quite intelligible.

DECEMBER 2, 1878

R. H. M. BOSANQUET, ESQ., M.A.,

IN THE CHAIR.

ON THE DETERMINATION OF ABSOLUTE PITCH BY THE COMMON HARMONIUM.

By LORD RAYLEIGH, M.A., F.R.S.

THE method of determining absolute pitch, to which I shall ask your attention this afternoon, does not pretend to compete in point of accuracy or completeness with some of the other methods which have been employed, particularly in the last few years, with success. But I think it stands alone in the extreme simplicity and general availability of the means which it employs. Of course to determine the pitch of a note you must have the note, and you must also have some standard of time. I hardly want more than that. All that is necessary is two notes on the harmonium, and a watch, and by those means alone I am able to say how many vibrations in a second the notes make. To carry out the observations *with ease* requires a little more in the way of instrumental assistance, but the feasibility of the method does not at all depend upon this extra assistance.

The principle which lies at the bottom of the method is not a new one. It is simply this—that if we know the exact interval (in the musical sense) between two sounds, and also know how many beats per second are occasioned by the simultaneous sounding of those notes, we are then in a position to tell exactly how many vibrations per second each makes. That principle has been applied by many observers, but, I believe, not in the form in which I have had occasion to use it. Suppose, for example, we had two notes on the harmonium which stand to one another exactly in the interval of an equal temperament major third. That interval is expressed by a long decimal, which I need not trouble you with, but at any rate it is known. When those two notes are sounded together they give rise to beats, and the beats which

are most conspicuous are those which arise from the simultaneous action of the overtones which are nearly in unison, namely the fifth component of the lower note and the fourth component of the higher note. Those two overtones would be perfectly coincident in pitch if the major third were true, but in the case of equal temperament major thirds those two overtones do not exactly coincide, and consequently they give rise to beats which in the lower part of the scale are slow enough to be counted, and when counted are sufficient in conjunction with the assumption that the equal temperament interval is correct to determine the frequency of the vibrations of the notes composing the chord. Of course in practice it would not do to take for granted that any two notes on the harmonium or any other instrument are perfectly to one another as the two notes of the equal temperament third; but the difficulty thence arising may be very simply evaded. We know that three equal temperament major thirds taken in succession make up an exact octave. All therefore that it would be necessary to do would be to count the beats due to the simultaneous action of these overtones as produced by the notes, say c and e, then having counted these beats for a given time, to count the beats produced by the simultaneous sounding of the e and the major third above that, g sharp, and having counted these beats to determine the third time the beats between g sharp and the octave c'. In that way we should have three facts about the beats of the four notes concerned, or practically of the three notes concerned, as the octave might be taken as true; and those three facts are sufficient without any further assumption whatever as to the truth of the intervals to determine the absolute frequencies of the notes. In practice it would not even be necessary to use the higher octave at all, because the third set of beats, namely that heard between g sharp and c', would be equally well counted when produced on the octave below c, so that all that it is necessary to use would be the c, e, and g sharp. The formulæ would be as follows. If x, y, z, 2 x be the frequencies of the notes, and a, b, c respectively the frequencies of the beats,

$$\left.\begin{aligned} 4\,y - 5\,x &= a. \\ 4\,z - 5\,y &= b. \\ 8\,x - 5\,z &= c. \end{aligned}\right\}$$

whence

$$\begin{aligned} x &= \tfrac{1}{9}\,(25\,a + 20\,b + 16\,c.) \\ y &= \tfrac{1}{9}\,(32\,a + 25\,b + 20\,c.) \\ z &= \tfrac{1}{9}\,(40\,a + 32\,b + 25\,c.) \end{aligned}$$

This method seems very simple and satisfactory at first sight, but practically it is useless with the harmonium, on account of the fact that the intervals are not sufficiently

constant. The notes on the harmonium are indeed constant compared with those of some other instruments used in practical music, but nevertheless they are not constant enough for such a purpose as this. In fact the very slightest change, not so much in the absolute pitch of any of the chords, but in the *intervals*, would throw very great errors into the final result. Indeed no method would be practically available which requires the assumption that a note is the same when it is sounded on two different occasions; because —although of course if the conditions were the same, if the temperature was the same, and the pressure was the same, then the note being produced under similar circumstances would be constant—in practice with an ordinary harmonium there is no means of maintaining the pressure very strictly constant, and the most careful working of the foot, even when the eye is aided by a pressure gauge, is not sufficient to prevent very material changes in the pitch of the notes. In particular, what might perhaps not have been so much expected, changes of pressure materially affect the *intervals* of two notes sounded simultaneously.

The method however which I am about to describe does not require any assumption as to the constancy of the notes to be determined. It depends simply on the use of two notes forming an interval of a whole tone—C and D, for example. The notes used were the lowest C and D on my harmonium. It is evident that if we could be sure that the frequencies of the two notes were for example exactly in the ratio of nine to eight, which is sometimes called a major tone, or, on the other hand, exactly in the ratio of ten to nine, which is called a minor tone, differing from the first by a comma, then one of the overtones of the one note would exactly coincide with another overtone of the second note, and in a certain sense the chord might be said to be in tune. But at the same time that those two overtones are coincident and therefore do not give rise to any beat, other overtones of the same notes are within beating distance of one another and do give beats that can be counted. Two facts about the notes would be sufficient to determine their frequencies: namely, the fact that they are in perfect tune together as a major tone, or as a minor tone (it does not matter which is taken), and the fact that the beats of the two notes regarded as forming the other interval are counted and known. In the harmonium as ordinarily tuned the whole tone is an equal temperament tone, which differs both from a major and from a minor tone, the fraction expressing the interval being 1·12246. I may observe that harmoniums as sold are in my experience very accurately tuned. The ratio corresponding to the minor tone ($\frac{10}{9}$) is 1·11111; the major tone ($\frac{9}{8}$) is 1·12500. It will be evident therefore that although the equal temperament tone differs both from the major tone and from

the minor tone and lies between them, that it is very much nearer to the major tone than to the minor. For the success of the method however it is not necessary that the interval of the two notes should be any thing in particular. In fact if we knew that the interval was exactly a major tone or exactly a minor tone, we should simply know that certain components of the two notes are so nearly in tune that they give no perceptible beats with one another, and in practice the truth of an interval can only be determined by either counting those beats or by otherwise assuring ourselves that they are too slow to be taken into account at all. So that in reality nothing would be gained by attempting to use as the interval in question either an exact major or an exact minor tone, and we may if we please take an equal temperament tone, counting the number of beats which occur between the tenth component of the lower note and the ninth component of the upper one and thus determining the deviation of the interval from the minor tone, and also counting the beats between the ninth component of the lower tone and the eighth component of the upper, that being the number of beats corresponding to the interval considered as a disturbed major tone. The beats as so counted include all the necessary data for the determination of the pitch. But it is rather more convenient to use two notes which make an interval with one another lying more nearly midway between a major and a minor tone than does the equal temperament tone. In that way the quicker beats are made slower, and although at the same time the slower beats are made quicker, nevertheless the counting is facilitated. Thus in making the experiment I flattened the upper note somewhat by the addition of a very minute fragment of soft wax to the free end of the reed, and in that way brought the interval between the two notes pretty nearly midway between a major and a minor tone.

For the same reason as I explained in speaking of the method depending on the third, it is necessary for the success of the result that the two observations of the beats should be made simultaneously and not in succession; because, if the observations were made in succession there is no security that you are dealing with really the same notes in the second counting as in the first. When the observations are made simultaneously, no question of that kind can arise. To make two observations simultaneously requires, of course, two observers to listen to the beats; because, I suppose even the most accomplished counter of beats, even Mr. Ellis himself, could not count two sets of beats at once, particularly when the pitch of the beats to be counted is not greatly different, and the rapidity of them is also not very different. Even with only one set of beats to count, an unpractised person might find some difficulty without artificial aid. I have had, myself, a good deal of practice in listening to overtones and their beats,

and should not find any great difficulty in doing it so far as hearing the beats is concerned; but it so happens that I am a remarkably bad counter and can hardly count even four a second with any certainty; but as far as merely hearing them is concerned, I should not absolutely require any assistance. But certainly the observation is immensely facilitated by using resonators tuned to the beats which are to be counted. For example, in the first set of beats in which the interval is regarded as a disturbed minor tone, we require a resonator tuned to the tenth component of the lower note, *i.e.*, e''. In listening to the beats corresponding to the interval considered as a disturbed major tone, we should require a resonator tuned to the note which is three octaves above the higher, that is, d'''. There is, therefore, a difference of a whole tone between the pitch of the two sets of beats, and in order to make the observation conveniently it is necessary to have resonators which can be tuned to these pitches in order to bring out the beats with the greatest possible distinctness. In using resonators for this purpose it is not necessary to have them made exactly to the pitch you want. All that is necessary is to take one somewhat higher than the pitch you wish to use, and then by passing your finger gradually over the mouth to depress the pitch until it comes into agreement with what is required. In practice the resonator would in that way be tuned, until the beats were heard as distinctly as possible, then the finger would be kept in position, and the counting would go on with greater facility.

But although resonators taken alone very much facilitate the counting, there is another circumstance which may be taken advantage of by which a still greater facility may be obtained. When a pure tone is sounding in a room the space included is traversed by surfaces on which the intensity of the sound is a minimum, in some cases almost zero. If therefore the observer, wishing to listen to the one set of beats, chooses a resonator tuned so that he may hear that as powerfully as possible, and at the same time selects a position where the other set is scarcely audible at all, it is evident that he will have magnified what he wants to hear, and will have very much diminished in intensity what he does not want to hear, namely, the other beats. In that way almost all chance of confusion between the two is completely avoided.

The experiment I made then was simply as follows: The two notes of the harmonium were put down, the blowing being maintained as uniformly as possible with the aid of a simple pressure-gauge, consisting of a bent glass tube containing a little coloured water. Although the gauge was used the pressure was not really very constant, because it is difficult with ordinary bellows to keep a sufficient constancy, and my object was not unduly to refine the apparatus by bringing

instruments of precision into the investigation. Of course, if a better bellows had been used the result would have been to some extent superior. The two listeners took up positions which were found suitable, and tuned their resonators to the notes whose beats they had to hear. Then at a given signal they begun to count. The beats were at the rate of about four a second, and at every ten a stroke was made on a piece of paper, and the counting was again begun from the beginning, one, two, three, to ten, and so on. At the end of ten minutes, at a second signal, the counting was stopped. The number of strokes was added up, multiplied by ten, and the odd numbers outstanding at the end added in, giving the total number of beats in both cases which occurred in 600 seconds. From these numbers the pitch of the notes follows at once by a very simple arithmetical calculation. I will give you one of the cases of observation made on September 16 for a period of ten minutes :—

Number of one set of beats counted	..	2392
Of the other set ...	... ..	2341

It is easily proved from those figures what the total number of vibrations per second of the lower note C of the harmonium is. It is worked out in this way :—

$$\frac{2392 \times 9 + 8 \times 2341}{600}.$$

When that fraction is calculated out it comes to 67·09; and it means that the lower C was making 67 and nearly $\frac{1}{10}$ vibration in a second of time.*. The observations were repeated much in the same way on four different occasions and these were the results arrived at: 67·09, 67·04, 67·29, 67·19. The greatest difference between these is not very considerable, and there is no doubt that the mean is extremely near the mark. Besides, it does not follow that the notes which were observed were really the same on those different occasions. It may very well have been, either from some change of the temperature or a varied pressure in blowing, that the C of the harmonium as determined on one day was not really the same note as determined on another, and therefore that those numbers, if they were perfectly correct at the time they were made, might not have perfectly agreed

There is not much use in determining the pitch of an instrument which cannot be considered constant; therefore it is

* In its algebraical form the calculation is as follows. If x and y be the frequencies of the notes, a and b the frequencies of the beats.

$$\begin{aligned} 9x - 8y &= a \\ 9y - 10x &= b, \end{aligned}$$

whence

$$\begin{aligned} x &= 9a + 8b. \\ y &= 10a + 9b. \end{aligned}$$

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of importance, where possible, to refer the determination to the best standard of pitch which can be obtained, generally a tuning-fork. I have a tuning-fork of Koenig's make, supposed to vibrate exactly 64 times in a second. On each day the harmonium was compared with the fork, so that, in fact, the notes of the harmonium were merely employed as a means of arriving at the pitch of the fork. A comparison between the harmonium and the fork was effected, of course, by counting the beats between the note of the harmonium and the note of the fork after the latter had been excited by bowing, and the time during which the beats could be counted was about 90 seconds. An objection might arise in comparing the fork with C on the harmonium, namely, that in the determination of the pitch the C had been sounded in conjunction with another note of the harmonium, namely, D, and that this pitch as sounded with D might not be quite the same as when sounded alone; but that objection may be overcome by comparing the harmonium with the fork while both notes, C and D, are sounding, in which there is no difficulty. The sound produced is, of course, by no means agreeable, but it does not interfere with comparing the notes with the tuning-fork nearly in unison with it. In that way, by making the observations on each day the results were these:—

Harmonium	67·09	Tuning-fork	64·06
,,	67·04	,,	64·07
,,	67·29	,,	64·17
,,	67·19	,,	63·98

The differences between these are small and the mean of them is no doubt extremely near the truth. The cause of such differences as exist is to be found principally in the difficulty of giving the time with sufficient accuracy. It is clear that if an error of one second was made in giving the time, and that does not seem much in ten minutes, it would make a difference of one part in 600; that is to say—if we had a second too little—we should have 6·39 instead of 6·40, or if there were a second too much we should have 6·41 instead of 6·40. The errors which occurred were not greater than could be explained in that way. An error of half a second in excess or in defect would certainly be quite possible, and taken together would produce a discrepancy of one part in 600.

My object in making the experiment was not so much to get a result which would compare in accuracy with the results of some other methods, as to see whether this really very simple method was practicable with fair accuracy; and I think the results prove that it did quite as much as could possibly be expected of it. Nevertheless I think, if it were worth while, that by making certain modifications in the method, almost

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any degree of accuracy could be obtained. In order to do that it would be almost a necessity to increase the length of the time of observation. Ten minutes is not a very long time to count beats, but when you are doing it, it seems about an hour; and of course as soon as the counters become confused there might be an error, and I do not know that practically it would be possible to work with advantage for any greater length of time than ten minutes without a change of observers. But I found it was perfectly feasible for observers to relieve one another without any break in the continuity of counting. That we satisfied ourselves of; so that if you had a sufficient number of observers and arranged for them to relieve one another in turns, there is no reason why you should not count beats for a month. An extension of time would be the main change required for getting greater accuracy; but something would be gained by an improved method of defining the interval of time over which the counting takes place. I think if those who listen to the beats were themselves able (perhaps by observation of a pendulum swinging conveniently before them) to see exactly what the time was, the error might have been reduced perhaps to half what it was when the time was called out by a third person. But these refinements would be of no use as far as the determining the pitch of the harmonium was concerned, because it is no use to determine with great accuracy a thing which may vary from day to day: of course the only object of the greater accuracy here is to determine the vibrations of a fork whose constancy is more perfect. In order to effect the comparison between the harmonium and the fork with the necessary accuracy, it would not do to make the comparison at a different time, because again the note of the harmonium might alter. It would therefore be necessary that all the sets of beats should be counted simultaneously for the whole time the observation was made. That would not be a matter of difficulty except that it would require the co-operation of several observers.

I think the interest in the method is rather in the fact that a result of considerable precision may be obtained with no other instrument than an harmonium and a watch (perhaps I ought to include resonators), in about a quarter of an hour.

DISCUSSION.

The CHAIRMAN said when he saw the title of this paper he wondered whether anything of real accuracy was intended to be arrived at, and had no conception that it was possible with the notes of an harmonium to get the results shown. He had

no conception it was possible to count the beats of two notes differing by a whole tone on an harmonium when sounding together; he should think it must require great education of the ear to do it; and he feared the method would never become a common one. He could hardly believe that a practical organ-builder would learn very easily to carry out this method. To the scientific man it seemed most valuable. There had been no method, as far as he knew, lately in use by which, without elaborate apparatus and considerable difficulty, fairly accurate determination of pitch could be arrived at. He gave a rule some time ago which he employed with his enharmonic harmonium, which had the advantage of presenting a number of notes closer together, which amounted to this: he tuned a whole tone by two perfect fifths, and divided the whole tone up into smaller intervals, so that as nearly as possible there should be four beats a second; there were generally about eight or nine intervals; and by counting the beats you could get a determination which was accurate enough for ordinary purposes; but it was quite rough in comparison with this method. Still for practical purposes some small instrument founded on that principle, he thought, would be found useful for practical men. Thus, if a pianoforte maker tuned his fork to 536, which would be nearly to the pitch now used, he would be able to determine it for himself with a small instrument provided with two independent bellows, with a sufficient number of reeds distributed alternately, so as to sound the successive notes without interfering with each other. An apparatus of that kind might be made very cheaply to carry out the rule he had given, without any objection from the notes interfering with each other by sounding together. But even with that he doubted whether such accuracy would be obtained as Lord Rayleigh had shown.

Mr. A. J. Ellis, F.R.S., &c., said he had been engaged for some time in the endeavour to arrive at something like an absolute pitch, and to verify the forks he had made, but he found it extremely difficult to be sure of the result within three, four, or five-tenths of a vibration. The difference in Lord Rayleigh's results were between one, two, and three-tenths, which was remarkably near. For example, Koenig's fork with 256 vibrations was certainly three-tenths too sharp, although he had had the most perfect instruments perhaps by which to make it. Professors Mayer and McLeod both agreed with this, and it also agreed with the observations he had made by means of copies of Scheibler's forks. He did not know whether Lord Rayleigh would allude in his next paper to the circumstances which occasioned a little difficulty with regard to taking the pitch from an harmonium the same as occurred in taking it from Appunn's tonometer. He found by experiments he made some years ago that the effect of the included

air in the tonometer was to increase the nominal value of the vibrations during the beats by about one per cent., throwing the beats up about one per cent. The results of comparing a number of different measurements made by Appunn with Scheibler's, had been to show that the increase was 1 in 120 to 1 in 128. He always used 1 in 120, and found his results came right within ·1 and ·2. In an harmonium you had something to cause an error, namely a pressure of air under which the beats took place, and it seemed to him there would be an increase in the nominal over the real beats arising from that circumstance. The mode he adopted was to have two tonometers, and he counted the beats between three successive reeds on one tonometer, then counted the beats between a reed in the first and a reed in the second, and again from the reed in the second back to the third reed in the first. In this way he got the external beats, and they gave the result he had stated. He feared there might be some such matter, but it would not make a great deal of difference, and would not perhaps amount to the possible error shown by these different determinations, and so it might be left out of consideration. He was rather doubtful about continuing with sufficient accuracy the pressure of wind in an harmonium. He did not know whether Lord Rayleigh could feel sure that the beats kept up to the same velocity throughout such a long interval as ten minutes. He had never tried to count beats for more than four minutes, and found that completely overwhelming; and he generally counted for only two minutes, but kept the beats going for twenty minutes or half an hour, and he found that by an arrangement Appunn had made to secure tolerably uniform pressure, there was no sensible variety in the beats, and it was curious how very soon the ear felt a very small alteration in the rate of beat. He was very glad to find that there was such a very simple method as this which was effective. With an Appunn tonometer he had counted the beats of $\frac{8}{9}$ and $\frac{9}{10}$, and he thus attempted to determine the pitch, but he did not obtain a degree of accuracy which was at all satisfactory. The only other instrument known to count for ten minutes was McLeod's, and he professed to get the third place of decimals correct, but then a variation in his astronomical clock of two or three seconds a day produced a difference in the result, and he did not think they could hope practically for any result nearer than ·1; this came within ·3 at any rate, and therefore the result was extremely good. For practical purposes of a person tuning an instrument, there was nothing equal to a set of forks graduated which could be made with quite sufficient accuracy, and his late observations for organ pitch had all been conducted with a set of forks for that purpose. He had a set of 10 C forks which varied by four

beats, and one of them he believed to be a perfectly accurate 512. These for practical purposes were decidedly the most convenient, because you could tune to any pitch at once, and arrange it as you pleased, allowing for difference of temperature in organ-tuning, which was of course of great importance.

Lord RAYLEIGH explained that he did not count the beats himself. He could hear beats very well, but he was so bad a counter, that the counting was handed over to two ladies who had but little experience in counting beats before, therefore he did not think the difficulty could be very great: there was no doubt that without resonators and the other precaution he had mentioned of choosing the best place in the room, the difficulty would be more considerable. With regard to the point raised by Mr. Ellis, he would say that the result so far as it related to the fork, was entirely uninfluenced by the two notes of the harmonium. With regard to the accuracy, he was surprised that these results should be considered so very accurate; they could not possibly have been more accurate, because the necessary errors in measuring the time fully accounted for the discrepancies which existed. There would be much less difficulty if the time were prolonged, as it could be by an interchange of observers, and in that way the accuracy might be carried to two decimal places further. No doubt that would be a tedious affair, and would not be of any use, unless you had a standard which could be trusted to a corresponding accuracy. Now a tuning-fork, as a rule, would only vibrate for about a minute and a half or two minutes, so as to give easily countable beats, and during that time it made only a limited number of vibrations; in fact, the pitch of a sonorous body vibrating freely could not be defined with any greater closeness than corresponded with the total number of vibrations which it was capable of executing before the sound died away; therefore, to get anything further than a fourth place of decimals, it would be necessary to have a standard whose sound could be maintained for a considerable time.

Mr. ELLIS said Professor McLeod maintained the sound of his fork by continuing bowing.

Lord RAYLEIGH said no doubt that plan would have to be applied if it were required to go to anything like Professor McLeod's accuracy by this method, but there was some question as to whether the effect of bowing was not slightly to alter the pitch. Professor McLeod thought the effect was insensible, and it certainly was exceedingly small. But a German observer thought he did detect a sensible effect; at any rate, there was some change of pitch depending on the amplitude of the fork, and that was an element which could not be maintained constant whether the fork vibrated freely or was maintained by the intermittent action of bowing. It

would, therefore, be impossible to go to higher places of decimals without a better standard of pitch than any they now possessed.

Lord RAYLEIGH then proceeded to read the following communication on

THE MUTUAL INFLUENCE OF TWO SOUNDS NEARLY IN UNISON.

THIS paper consists of a few observations I have made on the mutual influence of notes which are nearly in unison. My attention was first drawn markedly to the subject by the circumstance to which Mr. Ellis alluded, namely, that in Appunn's instrument the resulting pitch differs materially from that obtained by other trustworthy methods, which is, no doubt, to be explained by a small mutual influence between the consecutive reeds, by which the interval between them is made to appear somewhat greater than it properly is. But in the case of organ-pipes, and in some other cases, the influence is very much greater, and may be easily made the subject of measurement.

Perhaps I should say a little as a preface upon the character of the mutual influence as a mechanical phenomenon. When we have a vibrating body which is capable of two independent kinds of motion, there are, in general, two distinct periods of vibrations—two distinct kinds of vibration—which may go on either separately or simultaneously, and we have two distinct periods of vibration dependent on the nature of the system. Perhaps the simplest case to take would be a tuning-fork of low pitch, whose stalk is clamped in a vice. The experiment is most easily made with a thing which would hardly be called a tuning-fork, something which would vibrate from twenty to forty times a second, giving a note which would scarcely be audible. It might be thought that by a proper tuning of the two prongs of such a fork, the two notes of which the system is presumably capable might be brought into unison, and therefore the possibility of beats might be done away with. That is not the case. No matter how the prongs of the fork may be shaped, supposing them to be even mathematically similar and similarly constituted with regard to the stalk, and the material perfectly uniform, and everything as symmetrical as it could be, there would still be two distinct modes of vibration, having two distinct periods; and the excitation of the fork in general would give rise to both those modes of vibration, and therefore to the phenomena of beats. Of course it would be possible so to excite the fork that only one mode of vibration occurred, and then no beats would be heard. The cause of there being two notes in such a case depends on the necessarily imperfect rigidity of the stalk of

the tuning-fork. The first kind of vibration which the tuning-fork admits of is the one ordinarily contemplated, namely, that in which the two prongs go in and out simultaneously, and therefore have no tendency to move the stalk transversely, or set in motion the supports by which the fork is held. The other mode of vibration is that in which the two prongs sway simultaneously on the same side in which in fact the fork vibrates, just as a single bar would do in virtue of the elasticity of its prongs and stalk. These two modes of vibration would have exactly the same period provided the stalk was perfectly stiff, so as to be incapable of yielding at all, but practically that can never be the case; and the result is that that mode of vibration which does not tend to move the stalk, and for which the stalk, therefore, behaves practically the same as if it were perfectly stiff, has a higher rate of vibration than the other mode in which the stalk does tend to be bent, and under which it must practically yield a little. There are, therefore, two independent modes of vibration which have two different periods, and no matter how symmetrical and perfect the fork may be, the most general case of excitation of a fork, such as a blow on one of the prongs, would give rise to both modes, and therefore to beats. In the ordinary use of a fork in which it is held by the hand or by some soft substance, it is true the beats are not generally heard, because in that case one of the modes of vibration, namely, that which involves a vibration of the stalk, is very rapidly damped. It does not last nearly long enough practically to give rise to any very perceptible beat. But when a fork is firmly clamped in a vice these two modes of vibration may continue for a considerable time and the beats are very perceptible. That case is one which is perfectly within the grasp of the mechanical theory. There is no difficulty about it at all.

But practically the cases of greatest interest in connection with the subject of this paper are those in which the notes are maintained such as the notes of an harmonium or of organ-pipes. Unfortunately at the present time the theory of maintained notes is not sufficiently well understood to give us any very clear light on this subject, and of the mutual interference of notes nearly in unison. Nevertheless something may be done from theory and a great deal more perhaps by experiment.

If we have two organ-pipes whose natural pitch when sounded under a particular pressure of wind, removed from one another's influence, is so-and-so, when they are brought near together, it will be generally found that the pipes have influenced one another so that the pitch is modified by their contiguity. If the natural notes of the two pipes when at a distance from one another are extremely nearly in unison, it will be generally found when brought together only one note

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can be heard, and no perceptible beats, proving that the two original notes are not both in operation. It must not be supposed that only one of the pipes is sounding. It is easily proved on the contrary that both pipes are sounding, although they give only one note; in fact, each pipe influences its neighbour in such a fashion as to bring about a mode of vibration in which only one period is concerned. But the question then arises, what is the pitch of that note which occurs when the pipes, which may have been expected to give beats and which would give beats with one another if situated at a sufficient distance, are brought close together? It might have been expected perhaps that the two pipes being forced to sound only one note would choose a note intermediate in pitch between the notes of the two separate pipes, and by a careful observation we might expect to find that the pitch of the single note sounded when the two pipes are very near was midway between those of the pipes acting independently. I think that would have been the natural supposition to make; but that is not the case. The pitch of the two pipes when influencing one another does not lie between their pitches when acting independently, but lies outside them; and in most cases it is higher than either of the pipes acting alone. In some cases it may be the other way, but in organ-pipes it is higher. There is no particular difficulty in seeing why that is. Supposing that you have two very nearly similar pipes, only slightly mistuned, lying side by side, with their ends in contact. During the vibration air rushes in and out at the ends of both pipes; and, as you well know, the rush of air beyond the actual end of a pipe acts in some sense as a continuation to the pipe, and forces the pitch to be graver than would correspond to the exact length of the pipe, calculated according to the ordinary theory which supposes that at the end there is no variation of pressure at all. Now, when two pipes are sounding side by side and giving only one note, what happens is that the air as it rushes outwards from one end of one of the pipes, at the same time is rushing in at the end of the other pipe. In fact, the two pipes are always vibrating in opposite phases, as is well known to physicists. Two stopped pipes being set up side by side, tuned to perfect unison, and blown together, are said to *interfere* with one another, and give rise to very little sound at all, notwithstanding the fact that vibrations are going on in both pipes more powerfully than they would do if either were there alone. That interference of sound in the case of perfect unison is a proof that pipes tend to vibrate in opposite phases, so that when the air rushes out of one it rushes into the other. That circumstance diminishes the effect of the inrush of the outside air, because when one pipe is trying to get rid of its air, the other pipe is trying to take it, and therefore there is not the same impediment outside the mouth of the pipe as

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would exist in the case of a free pipe. On that account, what is called the correction for the open end is less when the two pipes are near one another than for either alone, and thus the pipes are practically shorter than when independent. That is only what might certainly have been expected so soon as it is known that the pipes are vibrating in opposite phases. But why they should do so has not hitherto, I believe, been properly explained. It cannot be explained, in fact, until we know more than we do now about the mechanism of maintained vibrations in general, and of organ-pipes in particular. The experiments I made were very simple. They consisted in putting together two open pipes of nearly the same pitch. They were blown from a regulated bellows (the bellows of Appunn's tonometer) which gives a very constant pressure indeed; and without a bellows capable of giving a constant pressure it is useless to try such experiments at all. The method of observation consisted in first determining the pitch of one pipe by sounding it simultaneously with a constant note and counting the beats between them. Then I determined in the same way the pitch of the second pipe; and, thirdly, I determined the pitch of the note given by both pipes sounding together. Of course if the mutual influence of the two pipes had caused the resultant note to be intermediate between the notes of the pipes, then the number of beats found in that way would have been intermediate too; but in point of fact it was the other way. In one case in which the two pipes were put together so that the blown ends were near to each other and the upper ends not near, the number of beats between the note of the two organ-pipes and the harmonium was 3·2 per second. In another trial, 3·1. When one pipe was taken alone, the number of beats was 4·5, 4·5; and when the other pipe was taken alone the number of beats was 4·8, 5·0. Now you will see the number of beats corresponding to the influencing of the two pipes did not lie between the number of beats corresponding to the pipes taken alone, but lay outside; and the numbers proved, in fact, that the two pipes sounding together gave a higher note than that of either sounding separately. Similar observations were made with pipes having their upper ends near to one another, and their blown ends not near. Also with stopped pipes in which the blown ends approximated.

At one time I was under the impression that at any rate part of this effect was due to some influence propagated back into the bellows—that, in fact, it was dependent on the two pipes being connected with the same bellows. That, however, is not the case, at any rate to any appreciable extent; because I found that when I connected two bottles containing water, tuned so as to give nearly the same note, placing one pretty close to the regulated bellows and the other at some considerable distance,

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the wind being led through a long india-rubber tube, that then these two bottles could be tuned so as to give very slow beats of about one in four seconds, those beats being pretty regular as far as the ear could judge, and the silence between the beats being exceedingly well-defined when a suitable position in the room was taken, so that there was not a doubt of half a second as to the moment of the silence. It did not appear that, although these two bottles were in connection with the same bellows, there was any perceptible mutual interference. I also tried the converse experiment of connecting the pipes with two different *bellows*, and I found that there was apparently just the same influence as when they were on the same bellows.

DISCUSSION.

The CHAIRMAN said this particular subject was one which he had felt a great interest in at various times. It was a peculiarity known to practical organ-builders under the name of "drawing." Thus they would speak of the way in which pipes "drew" in a swell box. He had had his attention drawn to it by the difficulty of tuning the pipes in his anharmonic organ when inclosed in a glass case. They were all stopped pipes, so that he could not say anything of open pipes. But his impression was that Lord Rayleigh's facts were only one side of the question, and that the resultant note of two pipes was sometimes between the pitch of the separate pipes, as well as above or below. He certainly had made two organ-pipes speak considerably below the note of either of the single pipes. He used generally two stopped pipes placed in front of each other, the "ears," as they were called, touching, so that they spoke right into each other; and his impression was that under these circumstances the resultant note was placed a whole tone below the natural note of either of the two,* which were generally about a comma apart. Other experiments were made by placing them side by side, the mouths standing parallel, and opening or shutting the part of the glass case which came close up to the mouths, but he could not remember the details. The matter was of the highest practical importance, for if they could find out what it was on which "drawing" depended, organ-builders would be much obliged to them, as they would often be able to plan out an instrument so as to get rid of what sometimes unexpectedly appeared and proved very vexatious. Lord Rayleigh had

* On referring to my record of this experiment, I find that the two pipes spoke together a note three commas below the lowest of the two pipes *as they stood*.—R. H. M. B.

alluded to the probable existence of interference, or rather reaction, in the case of Appunn's tonometer; to this he had called Mr. Ellis's attention some time ago. As to the question whether there is any reaction of organ-pipes on the bellows, he settled that some time ago, with the assistance of Messrs. Walker. They fitted up an eight-feet organ-pipe on a bellows; and he had the means of observing very accurately the time of descent of the bellows. If there were any reaction, the time should have been different when the pipe was prevented from speaking. The time of descent was determined when the pipe was speaking, and then again after stopping up the top of the pipe with a piece of felt, which allowed the air to flow through the mouth freely, whilst preventing its speaking. The result was that, after making a great many experiments, he could not discover the slightest difference in the time.

Mr. J. C. Bishop said this question of the similarity between organ-pipes was investigated in the very earliest times. He believed his grandfather, who had a great deal of experience, found that when he placed two diapasons of very nearly the same scale close together, they interrupted one another and sympathised; and in many of his organs they had found in making two diapasons, as he so often did in one organ, he raised the feet of one so that the mouths were on a different level. By that means he overcame the difficulty. It was possible for two pipes of a very different scale, if on the same level, to sympathise in the same way, when it became necessary to remove them from each other as far as possible. He had known instances of two large wooden pipes standing side by side, with the mouths very close to one another, one so much shorter than the other, as to speak half a note above, and yet they sympathised in this way, and it was very difficult to get rid of the vibration. In that case they had to put a panel between them, or something to interrupt the vibration proceeding from one pipe to the other.

Mr. Blaikley asked if the circumstance mentioned by the Chairman, of two wooden stopped pipes placed mouth to mouth sounding a tone lower, would not be accounted for by the fact that the mouth of each pipe when placed close together would be virtually more closed than the pipe sounding by itself?

The Chairman thought that was probably quite true.

Mr. W. H. Cummings said the fact of pipes robbing, or rather borrowing, or sympathising with one another, was noticed in a very practical form forty or fifty years ago, when the organ at York Minster, with nearly a hundred stops, was completed. It was found that when they pulled out all the stops, it produced about the same effect as when they used only half.

The Chairman said "drawing" was not quite the same thing as sympathy. Sympathy was where two pipes spoke together and destroyed one another's tone. But "drawing" was quite a different thing, affecting the pipes so that it was almost impos-

sible to tune them, because they did not speak the same note according as you tuned them in the one chord or the other.

Mr. Bishop said the practical organ-builder had hardly the means of investigating in any delicate form matters of this kind. He did more by his ear. With regard to the "drawing" of a pipe, those pipes which had been mentioned had been inclosed in boxes, so that they had not a large amount of atmosphere round them. There was great difficulty sometimes with the pipes in a swell box from being closed up so tightly that they had not sufficient air round their mouths to allow them to speak with the certainty that they would with more open pipes.

Dr. Stainer said he should like to know the exact meaning of each of the terms that had been used. Lord Rayleigh's results appeared to him to be different to what practical organ-builders had to deal with.

The Chairman said what he meant by "drawing" was that you had two pipes a small interval apart, which when they were tuned sounding together did not speak the same note as when sounded separately. Sympathy was where you had two pipes in absolute unison, which destroyed each other's tone.

Lord Rayleigh said his experiments referred only to unison. He had not attempted to investigate any mutual influence of pipes in any other case. He was quite aware that organ-builders were familiar with the effect of disturbance of pitch in this manner; but it struck him that the term "draw" would never have been applied to it if it had been known that the note of one pipe did not draw the other towards it. In fact, they did just the contrary, namely, they repelled one another, so that the pitch which resulted was not between those of the two individual pipes. Still, he had no doubt that the phenomenon was practically the same, though probably that name would not have been given had the facts been fully known. He should like to ask the same question as Mr. Blaikley had started, as to how Mr. Bosanquet determined what the pitch of the two pipes was when sounding independently. In his case, when he wanted to find out what the pitch of the pipe sounding independently was, he did not move the other pipe; the wind passed into both pipes all along, only when he wished a pipe not to sound he put a little cotton wool over the wind way, and sometimes something in the pipe, so that any obstruction caused by the presence of the pipe, as a pipe, was there in both cases. If two stopped pipes were brought to face one another there would be a powerful influence in the direction of obstruction, quite apart from any particular phenomenon depending on the vibration of the pipes. That would be an interesting phenomenon, but it was an entirely different one. It was interesting to find a case in which the pitch was really depressed, but he had not come across any example. He did

not think the influence depended very much on the air being closely confined; all that was necessary was that the pipes from which the air was escaping should be so near that the sound of one pipe was powerful at the mouth of the other.

The CHAIRMAN said in the case he spoke of all the pipes were in their places in the enharmonic organ, forming a regular system of tuning. Their pitch was known as they stood with the utmost accuracy. When he placed the pipes opposite each other he turned them round, and then determined the pitches in their altered position. There was one thing he had not mentioned before which seemed to be of interest, namely, that when the pipes were placed both facing the front, as the glass door was gradually shut a peculiar series of phenomena took place. The beats got slower and slower as the door was shut, and at last got very slow, and it almost appeared as if the combination hung in equilibrium before the resultant tone of the two pipes was arrived at. He had tried to make some sort of theory with regard to this, assuming a certain velocity produced by the action of one pipe on the mouth of the other. It was quite possible, of course, on the ordinary theory of the composition of velocities at the mouth to account for that phenomenon roughly.

Lord RAYLEIGH expressed a wish that Mr. Bosanquet would complete his experiments, for it was a pity that any careful observations of that sort should remain unknown. He had often observed the peculiar hesitation at the moment when the pipes were uncertain whether they should draw one another or not; as they were tuned gradually up, the beats stopped a great deal sooner than they ought to do. When there should have been a very slow beat there was no beat at all, and at the transition between complete beats and no beats there was a very peculiar hesitation; and in that state of things it was quite useless to count them, they were quite irregular, and the slightest breath of wind blowing towards the end of the pipe, which might slightly disturb the layer of wind, produced great interruption of the resultant sound. He had also made several experiments to see if he could find any mutual influence before drawing. It seemed certain that some such did exist, but it was relatively extremely small. It would appear, therefore, that the interval over which the notes drew one another so as to produce only one resultant sound was a considerable fraction, perhaps the greater part, of the interval over which they would appreciably affect one another at all, and therefore, while the beats were going on, they were not much disturbed from what they might have been expected to be in the absence of mutual influence.

Votes of thanks were then passed unanimously to Lord Rayleigh and to the Chairman.

G. A. MACFARREN, ESQ., M A., MUS. DOC.,
VICE-PRESIDENT, IN THE CHAIR.

ON THE GROWTH OF THE MODERN ORCHESTRA DURING THE PAST CENTURY.

By EBENEZER PROUT, Esq., B.A.

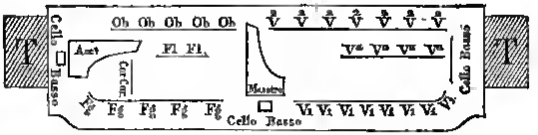
WHEN at the request of your Committee I promised to read a paper before this Association, I asked our secretary how long he wished it to occupy. He said, "About half an hour, or a little more." My first thought was, how am I to extend what I shall have to say over half an hour? But on beginning to put together my materials, I very soon found that the difficulty would be, not to fill half an hour, but to compress all, or anything like all, that there was to be said on the subject within that space of time. I shall, therefore, have to ask your indulgence for the necessarily incomplete, if not superficial, way in which I shall be obliged to treat my subject; to do it full justice would fill not a paper but a volume.

The question will perhaps suggest itself to some who are present, Why restrict the treatment of the subject to the last century? The answer to this inquiry is furnished by the scores of the older composers. The ancient orchestra differed in many material respects from that of the present day. In the works of Handel, and still more in those of Sebastian Bach, we find not only many instruments now entirely obsolete—such, for instance, as the lute, the theorbo, the viola da gamba, the violino piccolo and violoncello piccolo, among the strings, and the flûte-à-bec, the oboe d'amore, the oboe da caccia, and the cornetto among the wind—but we further see that even those instruments which are still in use were employed in a totally different manner from that now adopted. The balance of the strings and the wind was by no means the same as that of the modern orchestras. Through the kindness of Mr. de Pontigny, I am able to exhibit this afternoon a plan of the

opera orchestra of Dresden, as it existed under the direction of Hasse in 1754. It is taken from Rousseau's "Dictionnaire de Musique," and was considered, Jahn tells us in his life of Mozart, a model both for balance of tone and arrangement.

OPERA ORCHESTRA—DRESDEN, 1754.

UNDER THE DIRECTION OF HASSE.



Maestro.	Clavecin du Maître de Chapelle	1
Acc.t	—— id. d'accompagnement	1
Vi	Violini primi	8
V	„ secondi	7
V.e	Viole	4
Fl.	Flauti	2
Ob	Oboe	5
Cello	V.elli.	3
Basso.	Contrabassi	3
Cor.	Cors de chasse	2
Fg.	Fagotti	5
T	Une tribune de chaque côté pour les Timbales et Trompettes	3
		44

From Rousseau's "Dictionnaire de Musique." The number of trumpets is not given, but there are probably two.

It will be seen that the conductor sits at a harpsichord placed in the middle of the orchestra, in much the same position as now, but with the advantage of not turning his back on the instrumentalists. The proportions of the strings are nearly those which would be found in a modern small orchestra—eight first violins, seven seconds, four violas, three violoncellos, and three double-basses; but what should we say nowadays to five oboes and five bassoons against eight first violins? It must be remembered that we seldom find more than two parts for oboes, and only in exceptional cases more than one for bassoons; it is therefore evident that these parts must have been doubled like the strings. This fact, while it helps us to understand the manner in which the older composers wrote for their wind instruments, also shows us decisively the fundamental difference between the ancient and modern styles of orchestration.

Haydn has often, and justly, been called the "father of the orchestra." It was he who first definitely banished the various instruments now obsolete; in his scores we find nothing which is not still in use; moreover, he was to a very great extent the inventor of orchestral colouring, as that term is now understood. His methods of procedure have been improved and added to rather than changed by his successors; he unquestionably laid the foundation of the modern science of instrumentation. It is with Haydn, therefore, that a paper dealing with the growth of the *modern* orchestra ought most appropriately to commence.

It has frequently been remarked that Haydn owed much to Carl Philip Emanuel Bach, the second son of the great Sebastian Bach. To a certain extent this is undoubtedly true, especially as regards Haydn's earlier works; but in the orchestration of the two composers, while we find points of resemblance we also meet with important differences. Three symphonies by Emanuel Bach, published some years since in score by Peters of Leipzig, afford us opportunity for comparison; and a few words on these may be appropriate as showing the nature of Haydn's innovations. Bach's symphonies are written for two violins, viola, violoncello, double-bass, two flutes, two oboes, one bassoon, two horns, and harpsichord. We find in them a certain feeling for contrast of colour—as, for instance, in the first movement of the Symphony in D, where two oboes and the bassoon are answered by two flutes and the violoncello; we even find anticipations of some of Haydn's effects—such as sustained chords for the wind against moving passages for the strings (in the Symphony in E flat), or a melody for violins doubled by the flutes in the upper, and the bassoon in the lower octave (in the Symphony in F); but of what may be called systematic colouring, such as we find it even in the smallest of Haydn's symphonies, there is hardly a trace. To explain what I mean —every musician knows what a beautiful effect is obtained by a single holding note for a wind instrument—*e.g.*, a horn or an oboe—introduced in the middle of a passage for strings. Such passages may be met with in every score of Haydn; I have read carefully through Bach's three symphonies, and have found in them nothing analogous.

Another striking difference between the instrumentation of the two composers is seen in the use made by Bach of the *cembalo* or harpsichord. The part is written in the score on the same line as the double-bass, and the full figures given show that the instrument was played throughout the *tutti*, and even in many of the softer passages. Occasionally we find harmonies indicated by the figures which are not to be found in the other instrumental parts, and which prove that the harpsichord was *obbligato*. This is no doubt a relic—probably

the last—of the custom of the last century, as we find it in the scores of Handel and Sebastian Bach, when the conductor, instead of directing with a *bâton* as in our day, sat at the harpsichord to superintend the performance. Haydn never uses the instrument in his orchestral works; Herr Pohl in the first part (the only one yet published) of his "Haydn," gives us an account of the composer's first symphony, written in 1759—seventeen years earlier than those of Bach just referred to; it is scored for strings, two oboes, and two horns; but there is not a trace of the harpsichord. The instrument has finally disappeared; and its disappearance is in all probability due to Haydn.

It is impossible to describe in more than very general language the peculiarities of the orchestration of various composers. Details would mostly be unintelligible without the aid of musical illustrations; and even these would be useless to such of our audience as are not accustomed to reading scores. All that will be attempted will be to point out the general composition of their orchestras, with such remarks as may suggest themselves as to the special treatment of particular instruments.

Haydn's orchestra usually consists, beside the strings, of one or two flutes (more frequently one), two oboes, two bassoons, two horns, and in larger works two trumpets and drums. In his later scores we often also find clarinets; but it was Mozart who first gave this most valuable instrument its due importance in the orchestra. That Haydn's later style was much influenced by the music of Mozart, may be seen from his six grand masses written about 1790 for Prince Esterhazy, the scores of which are published by Breitkopf and Hartel, and also from his two oratorios. In saying this, I am not referring to his melodic style, which remained individual to the last, but to his instrumentation. There is considerable uncertainty as to the date of a large number of his works—an uncertainty which is likely to continue until the publication of Herr Pohl's promised chronological catalogue; but it is often possible to judge approximately of the period of a composition from the style of the orchestration, as well as from the character of the music. It will probably be safe to assume that the larger number of the symphonies written for quite a small orchestra, *i.e.*, in which oboes and horns are the only wind instruments, are early works, and that the compositions scored for a fuller band belong to a later period. In the latter we find, not greater complexity, for the twelve "Salomon" symphonies are as clear as anything Haydn ever wrote, but greater richness in the colouring.

The instrumental force enumerated above is but rarely exceeded in Haydn's scores. In none of his published symphonies do we find any trombones; these instruments are

indeed used in his oratorios—the "Passione" having only two, the alto and tenor. In these works also we find the contrafagotto, the effect of which in the "Creation" will be familiar to all present. In the same work we exceptionally meet with three flutes—in the introduction to the third part; while a piccolo is used in the "Seasons," to imitate the whistling of the "impatient husbandman" as he goes to his work. In the quartet "Virgo virginum præclara" of the "Stabat Mater" Haydn uses two corni inglesi, which in the old English edition of the score are curiously enough marked "Fagotti in E flat." In only one of Haydn's scores have I found four horns—in the Hunting Chorus of the "Seasons," and in this there are only two horn parts, each part being played by two instruments, to give it greater prominence.

It is comparatively seldom in Haydn's published scores that passages of any great extent or importance are to be found for wind instruments alone. One of the best known of these is the commencement of the trio, "On thee each living soul awaits," in the "Creation," the first thirty-three bars of which are scored entirely for wind. In this passage the influence of Mozart is clearly discernible, especially in the treatment of the clarinets. A less familiar but even more interesting example may be found in the interlude of seventy-one bars for wind instruments alone introduced between the fourth and fifth numbers of the "Passione," which was composed about 1786. This is scored for one flute, two oboes, two clarinets, two bassoons, contrafagotto, two horns, and two trombones; and many of the combinations—such, for example, as that of two clarinets with an alto trombone, two bassoons, and two trombones, *piano*, and others which might be cited—are, even at the present day, as novel as they would be effective in performance.

Mozart's orchestration is in its general character founded upon that of Haydn, the chief difference being that we find on the whole greater warmth of colouring, and a richer treatment of the wind instruments. It has been already said that Mozart was the first to perceive the full importance of the clarinet. In his earlier works it is seldom found, it is only during the last ten or twelve years of his life that he appears to have made frequent use of it; and even in his latest compositions we frequently find no clarinets. There are none in his last symphony—the "Jupiter"—nor in his last three pianoforte concertos. But that he well knew how to use them upon occasion is proved by the Symphony in E flat, and even more by the numerous effective clarinet passages to be found in his operas. It will suffice to refer to the arpeggios for this instrument in the trio of masks, in the first finale of "Don Giovanni," to the chorus, "Ah, grazie si rendano" ("Clemenza di Tito"), or the "Secondate" in "Così fan tutte,"

as examples. To Mozart we owe the introduction into the orchestra of the *corno di bassetto*—the alto of the clarinet. This instrument was invented in 1770—according to other authorities in 1777—and a few years later we find Mozart writing for it. Every musician knows the importance given to it in the "Zauberflote," and still more in the "Requiem." This fine instrument was once (and only once) used by Beethoven—in his "Prometheus;" I have not met with it in any more modern orchestral score, excepting in compositions for wind instruments only, such as Mendelssohn's "Military Overture" and his "Funeral March" for Norbert Burgmuller.

One of the special peculiarities of Mozart's instrumentation is his treatment of small and incomplete orchestras. In this respect his Salzburg life seems to have been of great importance in the development of his genius. Most of his masses were written for Salzburg, and at the cathedral there it appears that there were not even any violas in the band. The whole of the masses have lately been published in the new edition of Mozart's works; and an examination of the scores is full of interest. Some have only two violins, basses, and organ; others have also two trumpets and drums; a few contain in addition parts for two oboes; and the amount of resource shown by Mozart in dealing with so imperfect an instrumental force is really remarkable. In other works we see the composer boldly experimenting in novel instrumental combinations. Köchel's Thematic Catalogue enumerates many curiosities in this respect. There we find mentioned a Serenade for two violins, viola, and double-bass *soli*, accompanied by two violins, viola, violoncello, and kettle-drums; a Nottumo for four groups of instruments, each composed of two violins, viola, bass, and two horns, two Divertimenti for two flutes, five trumpets, and four kettle drums; pieces for two clarinets, and three *corni di bassetto*, a Contredanse for two violins, bass, two oboes, one piccolo, one trombone, and side-drum; and others equally curious. Of the effect of these combinations I cannot speak from personal knowledge, as the scores are not yet published in the new edition of Mozart's works.

Mozart's orchestration is seen at its best in his great operas, the scores of which are much more interesting to the student than those of the symphonies. Here we find none of the exceptional combinations just mentioned; strings, wood, horns, trumpets, and drums complete the instrumental force generally used. Only one of the greater operas—"Idomeneo"—has four horns, while trombones are used with the utmost reserve. We find them in the sentence of the Oracle in "Idomeneo," in the statue scene and second finale of "Don Giovanni," in the overture and priests' music of the "Zauberflöte," and nowhere else in all the operas. The modern fashion of adding trombone parts to "Figaro" and "Don Giovanni,"

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where Mozart has not written them, is an outrage on art which only very unparliamentary language would fitly characterise.

Mozart's special employment of the trombones in "Idomeneo" and "Don Giovanni" seems to have been borrowed from Gluck, about whose instrumentation a few words should be said in passing. Gluck can hardly be considered a great master of orchestration in the same sense as Mozart; but he possessed a very true feeling for dramatic colouring. He mostly employs his wind instruments either to double the violins, or for solo effects. His scores, especially the "Alceste" and the two "Iphigenias," abound in happy touches, in which a few notes—perhaps even a single note—will change the whole character of a passage. Many examples might be given, but his great operas are so little known, that a mere list of the titles of pieces would probably convey but little information to a large part of my audience.

It appears little short of presumption to attempt an analysis of the instrumentation of the greatest composer the world has yet seen—Beethoven. Yet a paper on modern orchestration in which his name was omitted would be indeed like the play of "Hamlet" with the part of the Prince of Denmark left out. The difficulty of describing Beethoven's orchestration arises in a great measure from its many-sidedness. He never repeats himself; always new, always true in art, we hardly ever find a passage in his scores in which an improvement seems possible. Only in the works written during the period of his total deafness do we occasionally find what may possibly be regarded as a miscalculated orchestral effect; and even these are of the rarest occurrence.

The composition of Beethoven's orchestra is in general the same as that of Mozart; it consists, besides the strings, of two flutes, two oboes, two clarinets, two bassoons, two horns, two trumpets, and drums. Occasionally a larger force is employed; in the "Eroica" Symphony there are three horns, and in the Choral Symphony four; four horns are also used in "Egmont," "Fidelio," the "Ruins of Athens," "King Stephen" the Mass in D, and a few other works. Trombones Beethoven employs very sparingly; in the symphonies we meet with them only in the finale to the C minor, the storm and finale of the "Pastoral," and the scherzo and finale of the Choral. Contrary to the usual method, the composer sometimes uses only two trombones instead of three; in the Pastoral Symphony we find an alto and tenor, and in "Fidelio" a tenor and bass. The contra-fagotto is met with in the fifth and ninth Symphonies, in the overture to "King Stephen," and in the Mass in D. The piccolo may be seen in the fifth, sixth, and ninth Symphonies, in the Battle Symphony, "Egmont," the "Ruins of Athens," and "King Stephen." The extra percussion instruments (big drum, cymbals and triangle) are only used on very rare occasions, such as the

finale to the Choral Symphony, where all possible vocal and instrumental force was required, and in the Turkish March in the "Ruins of Athens." The chorus of Dervishes in the same work contains a curious note by Beethoven, "Here all possible noisy instruments, such as castagnettes, bells, &c." No parts however, are written for these instruments in the score.

It will be seen from the above enumeration that Beethoven's contribution to the science of orchestration does not consist in the addition of new instruments. The most important difference between his treatment of the orchestra and that of his predecessors is found in the manner in which he individualises, so to speak, every instrument. Each is used in his scores in a different way from that in which it had been employed before him. It would take too long to enumerate all the examples of this which at once occur to the mind; a few only will be given to justify what has just been said.

Beethoven's violin parts are both more difficult and more brilliant than those of Mozart. I believe I am correct in saying that he was the first composer who ventured to write for the first violins as high as A *in alt;* in the overture to "Egmont" he even takes them up to C. As specially Beethovenish effects for the violins may be instanced the well-known quaver passage for the firsts and seconds in unison in the *coda* of the first movement of the C minor Symphony, the *coda* of the third "Leonora" overture, and the entire violin parts of the overture to "Coriolan." The violas have less importance with Beethoven than with some more modern composers; but the violoncello and double-bass are royally treated. It will suffice to mention the commencement of the slow movement in the C minor Symphony, the finale of the Choral Symphony, or the lovely violoncello solo in the duet of the "Mount of Olives." The well-known passages for the double-basses in the scherzo of the C minor Symphony should also be mentioned as one of the earliest instances of the employment of rapid successions of notes for this unwieldy instrument. It is recorded that when the symphony was first produced at the Conservatoire concerts in Paris, Habeneck, the conductor, found the passages in question so impracticable that he gave them to the violoncellos alone, suppressing the double-basses. We also find in Beethoven a more frequent use of double-notes and chords for strings than in Mozart. In the overture Op. 115, we exceptionally meet with a number of chords for the violoncellos.

The treatment of the wind instruments is no less individual than that of the strings. To name only two of the group—who before Beethoven ever used the horns in so original a manner as he has done, in the scherzo of the "Eroica" Symphony, or in the trio of the scherzo of the Symphony in A? Look again at his drum parts. All his predecessors had, with

very rare exceptions, used the drums simply as rhythmical instruments; Beethoven elevated them to the rank of important personages in the orchestra. It was he who first thought of tuning them otherwise than on the tonic and dominant—with what splendid effect witness the finale of the Symphony in F, and the scherzo of the Choral Symphony, in both of which they are tuned in octaves. Who before Beethoven ever dreamed of a duet for piano and kettle-drums, such as we see in the Concerto in E flat, or of such a solo for the drums as is found at the end of the adagio of the B flat Symphony?

Yet, after all, it is not by details such as these that Beethoven's orchestration can be estimated; it is in its total effect that its great power lies; and this is a matter of emotion rather than of analysis. As well attempt, by dissecting the brain of a Milton or a Shakespeare, to get at the secret of their intellectual power, as by analysing Beethoven's instrumentation to discover why it takes such a hold of a musical hearer. It is because, like his melody, his harmony, and his thematic treatment, it bears on itself the stamp of genius; it is to be felt, and to be admired, rather than to be too closely investigated.

With Beethoven the science of orchestration, invented by Haydn, improved by Mozart, may be said to have been perfected. It would be untrue to say that nothing has since been added to our instrumental resources; but this at least may be affirmed—that all his successors have worked upon the same general lines which he laid down; though the details of procedure have varied according to the individuality of each composer.

Before speaking of the successors of Beethoven, there are a few of his illustrious contemporaries concerning whom, because of the importance and originality of their instrumentation, a few words should be said.

The first of these is Cherubini. Though the music of this great composer is, excepting a few pieces, most undeservedly neglected in the present day, there are few writers whose works as models of purity better merit the attention of the student. His orchestration is unique; no one has since attempted, so far as I am aware, to copy it; in its simple beauty it reminds one of the masterpieces of ancient statuary. The chief characteristics of Cherubini's style of instrumentation are, first, the contrapuntal treatment of the different parts; and secondly his extreme economy in the use of his resources. We seldom, if ever, find one note introduced in his scores without a special object; his works abound in the most exquisite touches of colouring; but nearly all are produced with the fewest possible notes. Indeed, so far is this reserve carried that in some of his operas the whole resources of the orchestra of his day are never used at all. The scores of "Médée," "Elise," and "Les Deux Journées" contain not one note for trumpets from first to

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last. As a compensation, in the first two named of these works, Cherubini has four horns, which he uses to enrich the middle harmonies. Probably with the same object, we find in his scores, more frequently than in any others of the same period, the violoncellos separated from the double-basses, and either giving a fifth part to the harmony of the strings or playing in unison with the violas. This richness of the middle parts is one of the special features of Cherubini's orchestration. He is also very partial to the effect of solo passages for wind instruments, which he frequently treats in the most felicitous manner, as for instance in the "Gratias" of his great Mass in D minor, with its flute, oboe, and bassoon solos. That he could upon occasion handle a large orchestra in a most masterly manner may be seen from his Coronation Mass in A, the score of which contains a piccolo, four horns, three trombones, and an ophicleide. Even in this work, however, the composer's love for delicate effects shows itself from time to time in a no less striking manner than elsewhere.

Schubert, "the poet, if ever there was one," as Liszt has well styled him, shows his poetry in his instrumentation no less than in his melody. If we consider how seldom he had the opportunity of hearing any of his orchestral works performed, the beauty of his colouring becomes a matter for absolute astonishment. In his treatment of the strings we find little to call for remark, excepting his appreciation of the melodic powers of the violoncello—as in the slow movement of his Symphony in C, or the "Et incarnatus" of the Mass in E flat; but for the wind he seems to have had a special love. Even Beethoven himself hardly made the wood instruments *converse*, as Schubert has done in the "Rosamunde" music, or the andante of the "Tragic Symphony," while he may be almost said to be the inventor of *pianissimo* effects for horns and trombones, though we exceptionally find these even in the works of Mozart—as in the Motett "Ne pulvis" and in the "Zauberflöte." But in Schubert's later scores, especially in the Symphonies in B minor and C, the "Rosamunde" music, and the Mass in E flat, this treatment of the brass becomes a special characteristic of the scoring, and it imparts a colouring to the music different altogether to that which we find in Beethoven. The comparatively small influence which Schubert's orchestration has had upon his successors may probably be explained by the fact that until within the last few years hardly any of his scores were published. In one at least of the composers of the present day that influence is clearly to be seen. No one can examine the scores of Johannes Brahms without feeling that in the matter of orchestration he has drunk deeply at the well of Schubert's inspirations.

One other of Beethoven's contemporaries yet remains to be mentioned—Carl Maria von Weber. There is so much of

interest and importance attaching to Weber's instrumentation that it would be far easier to read a paper on this subject alone than to compress within a few sentences all that ought to be said upon it. Each of his great operas, the "Freischütz," "Euryanthe," and "Oberon," would well deserve a special analysis. His orchestration is essentially dramatic. How thoroughly different is the colouring of the choruses of knights and courtly ladies in "Euryanthe" from that of the choruses of peasants in the "Freischütz!" how distinct the characterisation by the orchestra of Agatha, Annette, Max, and Caspar, or in "Oberon" of Rezia and Fatima, of Huon and Scherasmin! I must, however, confine my remarks to a few of the more salient points which strike the student of Weber's scores.

Weber was the first to use four horns and trombones as an integral part of the ordinary orchestra, instead of (like Mozart and Beethoven) reserving them for special effects. That the constant presence of the whole mass of brass has, in modern compositions, frequently led to their abuse is indisputable; but this is no argument against their judicious employment; and Weber's scoring is richer and more brilliant than that of his predecessors because he was the first to use freely, without misusing, these valuable constituents of the modern instrumental force. Even with him we occasionally find (especially in "Oberon") a tendency to overpower the voice by the orchestra; there are passages in "O, 'tis a glorious sight," and "Ocean, thou mighty monster," in which only singers of exceptional power can make head against the overwhelming accompaniment; but such cases are comparatively rare.

It has been already said that Mozart was the first fully to appreciate the resources of the clarinet; but it cannot be denied that in this respect Weber has surpassed him. The composer of the "Freischütz" invented what Berlioz has so happily called "coldly threatening effects," "dark accents of motionless rage." The "Wolf's Glen" scene of the "Freischütz," and the introduction of the overture to the same opera, will doubtless occur to my hearers as illustrations; while the opening symphony of Adolar's air in the second act of "Euryanthe," and the clarinet solos in the allegros of the "Freischütz" and "Oberon" overtures, may be referred to as examples of the use of the instrument in the medium and upper parts of its compass. For the bassoon and horn also Weber has afforded exceptional opportunities of display; all his scores abound in solo passages for these important instruments.

Exceptional combinations are not very common with Weber; we may note among these the two piccolos in addition to two flutes in certain parts of the "Freischütz," the two solo violoncellos which play an important part in the song "Glöcklein im Thale" in "Euryanthe," and the exquisite accom-

paniment for *pizzicato* strings, one flute, and three horns, to the romance "Einsam bin ich nicht alleine" in "Preciosa." It is also worth while to mention the first use of three drums, in the overtures to "Peter Schmoll" and the "Ruler of the Spirits," and the first appearance that I have met with of a wind band on the stage in the Bridal March in the third act of "Euryanthe;" the stage orchestra consisting of two piccolos, two oboes, two clarinets, two basaoons, two horns, two trumpets, three trombones and drums.

Yet another point to be remarked in Weber's orchestration is his power of depicting the supernatural. It is said that Beethoven, after reading the score of the "Wolf's Glen" scene in the "Freischütz," said, "It is very queer, and yet it's true!" The susceptible hearer cannot but concur in Beethoven's observation; the perfect appropriateness of the music to the situation, fantastic though it be, is self-evident. Take, for instance, the passing of the wild hunt, with the strange, almost unearthly dissonances for the horns and trombones. Can anything be imagined more descriptive? Or again, in a totally different style, what is more ethereal than the opening chorus of "Oberon," "Light as fairy foot can fall"? The sustained notes of the horn, blending with the chords of the muted strings and the arpeggios of the flutes and clarinets, transport us at once into the realm of fairy-land. It would be a "bull" to say that all this is natural; we may at least say, "Se non è vero, è ben trovato."

Of all the successors of Beethoven, the palm in the matter of orchestration will probably, by common consent, be awarded to Mendelssohn. This is not the place for discussing his general position as a composer; on this matter opinions differ, and will probably continue to do so; but to his claim as a perfect master of instrumentation there can hardly be a dispute. His style of orchestration is founded upon that of Beethoven and Weber, while distinctly coloured with his own individuality. The chief characteristics of his scoring are the perfect artistic finish of every bar, and (in the large majority of his works) the extremely reserved use made of the trombones. It would perhaps be unjust to the memory of the composer to say that his orchestration was becoming more noisy towards the close of his life; but it is a simple matter of fact, which any one can verify for himself, that the brass is more freely employed in two of his last large works—the "Elijah" and the unfinished "Christus"—than in any other of his scores.

If asked to name the most representative of Mendelssohn's works from the point of view of their instrumentation, musicians would probably agree in selecting the "Midsummer Night's Dream" music, and the "First Walpurgis Night." In these we find the master at his very best; and there are few of his characteristic combina-

tions which will not be met with in the pages of these two scores. Foremost among these must be mentioned his use of rapid passages *staccato* for the wind instruments, sometimes alone, as in the scherzo of the "Midsummer Night's Dream," sometimes as an accompaniment to a melody played by the violins, as in the opening of the Italian Symphony. The germ of this latter effect may perhaps be traced to the allegretto of Beethoven's eighth Symphony; but with Beethoven the *tempo* is much slower, and the impression produced is consequently different. Mendelssohn, also, was one of the first to divide his violins, as in the "Midsummer Night's Dream" overture. We meet with divided violins exceptionally in Weber (overture to "Euryanthe"); but neither Haydn, Mozart, nor Beethoven appears to have used this device. The division of the violas is also often to be met with in Mendelssohn, who shows a special partiality for the tone of this instrument. In the air "Lord God of Abraham," in "Elijah," the upper part of the quartet is given to the violas almost throughout; while the composer is perhaps the inventor of the combination of two violas with two clarinets, as seen in the second subject of the first allegro of the "Lobgesang" Symphony, and elsewhere; though a somewhat similar effect will be found in the Hymn of the Vestals in the first act of Spontini's "La Vestale." Mendelssohn also makes frequent use of the violoncellos as melodic instruments, as in the Scotch Symphony (first movement), the overture to "Son and Stranger," the intermezzo of the "Midsummer Night's Dream," and the air "It is enough," in "Elijah." In the overture to "Ruy Blas" we see a peculiarly rich combination of violas, violoncellos, two clarinets in their lowest register, and two bassoons, all in unison. Of the wind instruments the clarinet appears to have been the object of his especial affection. It will suffice to mention the second subject of the "Hebrides" overture (where it occurs in B major), the delicious solo in the overture to the "Walpurgis Night," announcing the coming of spring, and the charming effect of the two clarinets entering in the key of A major in the "Pilgrims' March" of the Italian Symphony, to show how finely Mendelssohn has treated the instrument; but it must not be inferred that other components of the orchestra are therefore unduly neglected. Did time permit, it would be easy to refer to passages in which each instrument is displayed to the utmost advantage.

To the student Mendelssohn's scores are of great value as inculcating by example moderation in the treatment of the brass. Most musicians will agree that the rarer the occasions on which trumpets and trombones are introduced, the greater will be their effect when they do appear; and from this point

of view such scores as those of "St. Paul," the "Lobgesang," and the "Walpurgis Night" are models. In many choruses where we might not unreasonably have expected to find trombones, they are not used at all—*e.g.*, in "St. Paul," in "Lord, thou alone art God," "Now this man ceaseth not," "The gods themselves as mortals have descended," and "This is Jehovah's temple." Proportionately more striking is the result when the whole instrumental force is brought into play. In the 114th Psalm, for example, the first three movements contain nothing above horns; but with the change into C major the entire force of the brass, with the drums, is introduced to emphasise with all possible power the words "At the Lord's coming ye trembled." A similar effect may be seen at the modulation into A major in the opening chorus of the "Loreley" finale; and nearly all Mendelssohn's scores abound in passages which show how well, with the brass, he appreciated the golden virtue of silence.

A notice of Mendelssohn's orchestration would be incomplete without some remarks on his masterly treatment of the organ in combination with the orchestra. In most of his sacred works the employment of the organ is carefully indicated; while four of his scores ("St. Paul," "Elijah," the "Lobgesang," and the 98th Psalm) contain a fully written-out organ part. Here, no less than in his treatment of the brass, the composer's unerring tact is seen to the greatest advantage; he does not, like Bach, use the instrument to play with voices and orchestra throughout a movement, but reserves it for special passages where a broad and majestic tone is required. The scores of "St Paul" and the "Lobgesang" are particularly instructive from this point of view.

Mendelssohn was the first modern German composer to appreciate the harp. In his sacred music we find it only in the 98th Psalm; but in his "Athalie," "Antigone," and "Œdipus" it occupies a very important place. The charming combination of the harp with the horns and trombones in the chorus of "Athalie," "Lord, let us hear thy voice," will be familiar to most of our audience.

Robert Schumann, intellectual, deeply emotional as he is, did but little to advance the science of instrumentation. Of all the great masters he has written the least skilfully for the orchestra. His scoring is mostly too thick; he frequently doubles his parts in unison till the tone-colour becomes turbid; and though we occasionally find happy orchestral effects in his works, his scores cannot for beauty of colouring be compared with those of Schubert, Weber, or Mendelssohn. It should be mentioned that he was the first to introduce into the orchestra the ventil- or valve-horn, in addition to the ordinary natural horn. He also frequently uses valve-trumpets.

I have already trespassed upon your patience at such length

that I must pass hastily over the remaining part of my subject. Had time allowed, it would have been interesting to dwell on the scores of Spontini, the first to adopt the system that has been described as "orchestration by large masses," to speak of the almost luscious richness of Rossini's instrumentation in "Guillaume Tell" and the "Stabat Mater," to dilate upon the piquancy of Auber's combinations, or the general characteristics of modern French orchestral music. These I am compelled to pass over, and shall devote the few minutes that still remain to me to two composers who, perhaps more than any others, have influenced the modern style of orchestration—Meyerbeer and Wagner.

In Meyerbeer's latest scores—his earlier works written in the Italian style are now mostly forgotten—we see the influence to a considerable extent of the music of his friend and fellow-pupil Weber, of whose instrumentation that of the "Huguenots" may be considered as the continuation and the modernisation. No composer ever spent more pains over the details of his work than did Meyerbeer. One of his private secretaries once told me that he had known him to rewrite a movement eight or nine times before he was satisfied with it. The traces of this continual retouching may be seen in his scoring, which often has the appearance of being carefully put together like an elaborate mosaic, rather than of having flowed hot from his brain. And yet, with all the extreme richness of his instrumentation, it is but seldom that we find in his orchestra more than four real parts. These parts he often doubles, sometimes in three octaves, giving an effect of great fulness without destroying perfect clearness. As an example may be named the *orgie* at the commencement of the "Huguenots," where a four-part harmony is so disposed over the whole orchestra as to impart the greatest richness to the colouring. If the score be analysed, its construction will be seen to be as simple as possible.

One of the peculiarities of Meyerbeer's orchestration, and one which he appears to have borrowed from Weber, consists in the individualising of his characters by allotting special instruments to accompany each. In this respect he goes far beyond his model. The whole music of Bertram in "Robert le Diable" or of Marcel in the "Huguenots" will illustrate what is here meant. The frequent use of the trombones in the former case, and of the violoncellos, basses, and bassoons in the latter, gives a special colouring to these two parts. It is not of course meant that the composer always uses the same combination to accompany the same singer; but that he very frequently does so—at all events often enough to give a distinctive character to the part, especially in its most important dramatic moments. Probably the earliest instance of this procedure is to be seen in the "Freischütz," where the appearance of Zamiel is almost

always accompanied by low notes of the clarinets, and the dull pulsations of the drum on the first inversion of the chord of the diminished seventh.

By the numerous additions which in his latter works he made to the orchestra, Meyerbeer seems to have paved the way for the innovations of Wagner. In "Robert," excepting the corno inglese accompanying the well-known scena in the fourth act, "Robert, toi que j'aime," we find only the usual instrumental force; but in the "Huguenots" we find not only the corno inglese, but in the fifth act a bass clarinet (introduced on this occasion, I believe, for the first time), and throughout the score four trumpets—two natural and two with pistons. In his later works a still larger orchestra is met with; for example, the overture to "Dinorah" is scored for strings, two piccolos, two flutes, two oboes, one corno inglese, two clarinets, one bass clarinet, two bassoons, four horns, two trumpets, three trombones, a harmonium, a harp, a bell in F sharp, kettle-drums, bass drum and cymbals, and military drum; while the march composed for the opening of the International Exhibition of 1862 has strings, two piccolos, two flutes, two oboes, two clarinets, one bass clarinet, four bassoons, four horns, two ordinary trumpets, two valve-trumpets, three trombones, an ophicleide, three kettle-drums, and bass drum and cymbals. The wish of the composer in thus increasing his forces appears to have been, to some extent at least, to obtain full harmony of a uniform or nearly uniform tone-colour. Another noteworthy point in Meyerbeer's late scores is the importance frequently given to an orchestra of brass instruments on the stage. I have not had the opportunity of examining these scores for myself; but I learn from M. Lavoix's excellent "History of Instrumentation"—to which I may take this opportunity of acknowledging my indebtedness for some of the facts mentioned in this paper—that in the "Prophète" there is a complete orchestra of saxhorns—soprano, alto, baritone, bass, and contrabass, and that these same instruments are also used in "L'Etoile du Nord" and "L'Africaine." We are here a long way in advance of the orchestra of Mozart and Beethoven; whether altogether to the advantage of the instrumentation is another question.

Before speaking of Wagner a few words should be said of Hector Berlioz. This great genius (for such, with all his eccentricity, he undoubtedly was) possessed in no ordinary degree the feeling for tone-colour. Even when writing only for the instruments in ordinary use, he finds an infinity of new combinations, and the quality of tone he obtains from his orchestra is frequently as novel as it is beautiful. To name even a fair proportion of his inventions in this respect would be a very long task; one or two only may be given as examples. He was the first to employ the artificial harmonics

of the violins in full harmony, and to use in the orchestra the harmonics of the harp, as in the Queen Mab scherzo of the "Roméo et Juliette." In his Fantasia on Shakespeare's "Tempest" he uses the piano as an orchestral instrument, combining its arpeggios with passages for violins and wood wind. In his "Requiem" he uses for the first time what are called the *pedal* notes of the trombone, while in the same work, by employing eight pairs of kettle drums, he obtains full chords for those instruments. These few specimens will suffice to show the character of some of his innovations, though his orchestration must be heard to be understood; it cannot be described in words.

Richard Wagner, undoubtedly the greatest living colourist for the orchestra, did not show himself an innovator to any great extent at the commencement of his career: his scores of the "Flying Dutchman" and "Tannhäuser," though full of masterly details, and abounding in traits of the composer's individuality, do not differ essentially in their composition from those of his contemporaries. It is in "Lohengrin" that we first see a decided step in a new direction. This step consists in taking three wind instruments of each tone-colour, instead of two, as was previously the custom. The same point has been incidentally referred to in speaking of Meyerbeer; but there is this important difference between the two composers, that with Meyerbeer the procedure is occasional, with Wagner habitual. The "Lohengrin," and also the "Tristan und Isolde," contain parts for three flutes (or two flutes and piccolo), three oboes (or two oboes and como inglese), three clarinets (or two clarinets and bass clarinet), three bassoons, four horns, three trumpets, three trombones and bass tuba, besides percussion instruments, strings, and harp. The horns are always ventil-horns, and the corno inglese and the bass clarinet are now not only regular components of the orchestra, but are treated with extreme felicity. In the "Ring des Nibelungen" Wagner has proceeded still further in the same direction. The composition of the orchestra in this work is unusual enough to be worth giving *in extenso*. It is as follows:—

Sixteen first and sixteen second violins, twelve violas, twelve violoncellos, and eight double-basses; three flutes and one piccolo (the third flute sometimes playing a second piccolo), three oboes, and one corno inglese (sometimes a fourth oboe), three clarinets, and a bass clarinet, three bassoons; eight horns, two tenor and two bass tubas (played when required by four of the hom-players), one contrabass tuba, three trumpets, one bass trumpet, three trombones, one contrabass trombone (sometimes instead a fourth trombone); two pairs of kettle-drums, one triangle, one pair of cymbals, one side-drum, one glockenspiel, and six harps.

Of the richness, beauty, and infinite variety of this orchestra

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it is impossible to give the least idea to any one who has not either heard it or studied the score. Frequently one group of instruments is used alone, as in the last scene of "Rheingold," where Alberich's ejaculations of impotent rage are accompanied by sinister chords for the low notes of clarinets and bass clarinet; sometimes, as at the commencement of the last act of "Götterdämmerung," we have the eight horns interweaving in full harmony on a holding note of the basses. In the second act of "Die Walküre" a charming effect is produced by the alternation of chords for different qualities of brass instruments—four tubas being answered by four horns, and these again by trumpets and trombones. It would be impossible to specify a tenth part of the new combinations to be met with in these remarkable scores. One very striking point should be mentioned: that, although so extensive an orchestra is used, it is managed with such consummate skill that at the Bayreuth performances in 1876 the voices were never overpowered.

It has often been said that history repeats itself; and it is a curious thing in the history of instrumentation that the method which Wagner has adopted in his last work is in reality a return to the system of orchestration in vogue in the sixteenth and seventeenth centuries, in which families of instruments (whether strings, flutes, oboes, trombones, or what not) were mostly used alone. It is hardly to be expected that the score of the "Ring des Nibelungen" will be taken as a model by composers, because of the exceptional number of instruments used therein; but the fact of the probably accidental coincidence of Wagner's method with that in use three centuries ago is interesting enough to be worth mention.

The question as to the probable future of instrumentation is too large for discussion here at any length. The modern tendency, it is to be feared, is in favour of noise; in recent works abuse of the brass and percussion instruments is only too frequent. It would be foolish to deny that the introduction of the ventil in horns and trumpets has enlarged the resources of those instruments; but it is at least doubtful whether this has been an unmixed advantage. Their increased scale offers great temptations to the composer to be instant with them in season and out of season; and while their frequent use adds richness to the orchestral tone, and offers an easy means of obtaining the applause of an unthinking public, it soon gives a monotony to the instrumentation. Is it too much to say that he is the greatest master who can produce the most striking effects with the smallest means? If I may venture to express a personal opinion, I would say that while I can thoroughly enjoy reading a score by Meyerbeer or Wagner, such works as "Figaro," "Les Deux Journées," or "Fidelio," afford me, from the point of view of the instrumentation merely, at least

as much gratification. In Mozart and Beethoven the tone-colour is constantly changing; with many modern composers, the constant richness is apt to become cloying. The success achieved is sometimes in inverse proportion to the means employed.

In concluding this paper, let me apologise for its necessarily incomplete character. Much has been omitted which would have been both interesting and important; if anything has been said which will help my hearers to form an idea of the gradual development of the orchestra from the time of Haydn to the present day, its object will have been attained.

DISCUSSION.

The CHAIRMAN, in proposing a cordial vote of thanks to Mr. Prout for his very valuable paper, said the subject had been treated with as much imagination as learning; and it was one of immense interest not only to musical students, but to every lover of music. Those who had not made a technical study of orchestration would have their interest in musical performances greatly enhanced by this highly intelligent indication of the beauties of that special branch of the art, and their recollections of this paper would largely increase their interest in any performance they might have the happiness to listen to. The musical student would be profited in another and perhaps more valuable direction in the knowledge he would gain as to how to analyse the scores of the great masters, and to assimilate to himself the result of such analysis. He could quite feel the difficulty which Mr. Prout had experienced in compressing his materials, and it was marvellous how he had concentrated into so short a time so much valuable information. It might be called an encyclopedia of the subject, for everything most interesting had been touched upon, and many things had been displayed in a very bright light. He must, however, ask Mr. Prout's pardon for alluding to one particular composer, who he believed had had a vast influence on music in this department, and whose orchestration was so beautiful in itself as to induce almost boundless imitation—he referred to Spohr. The time was when Spohr's music in this country was, if not the food, at any rate the sweetmeat, of every musical schoolboy; everybody went to his sugar-plum shop to help himself, and some people, he feared, even beyond their honest pocket-money, and almost to the point of theft. He wondered, therefore, that a writer so mentorious in himself, and so influential upon other composers, had been omitted.

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One point very prominent in the early part of Mr. Prout's paper differed from his own suppositions, but he would waive them in deference to the minute reading which that gentleman had evidently given to the matter, namely, as to the chronology relatively of Mozart and Haydn. They knew that Mozart was born so many years after Haydn, but they knew also that Haydn lived eighteen years after Mozart, and that all his works in which the orchestration was most remarkable belonged to his latter period; therefore, although his birth would make him the elder, the registration of his works placed him rather as the successor than the predecessor of Mozart. The comparison, so far as he had been able to make, of their works seemed to show that Mozart was rather the originator than the follower of a man whom he respected to the extent of taking any advice which his grand example could afford. It was to be noted that quite exceptionally Haydn did at least once employ the pianoforte as an orchestral instrument, namely, in the Symphony in B flat in the Salomon series; it had but little to do, but it was quite conspicuous when it came in. It was worth noting that it must have been the practice in older times to let certain players pass from one instrument to another; for they found particular instruments only employed in certain pieces, and one could hardly suppose, with the strict economy of those times, that artists would have been engaged to play a single piece throughout the evening. They might probably have played duplicates with the violins; thus of four horn-players two might possibly have had other work throughout the evening. The case of the Salzburg masses suggested another important thing for consideration; that the seemingly exceptional combinations by Mozart must have arisen not from choice, but because occasion required parts to be written for the instruments in question, and such was very probably the reason of some exceptional arrangements in his chamber music, such as the trio for the pianoforte, clarinet, and viola. But he was not the only person who had been influenced in his choice of instruments by the possibilities of the occasion for which he was employed. The speaker had reason to believe that this occasional pursuit of effect under difficulties was a most valuable schooling for one who wished to learn to write for the orchestra; to be compelled to produce an effect out of small means was the way to enlarge enormously the extent of the fullest means. For while you had these boundless masses of instruments of which they had heard, you still had those small means to employ in opposition to them; and he thought that, in art as in nature, the microscope revealed as much beauty as the telescope. It was by these minute effects that some of the most powerful appeals to the sympathy, the admiration, and emotion of the hearers had been made. It was sadly to be deprecated that the orchestra had been increased to the extent it was now, for

beauty of effect had by no means grown with the growth of means. He thought that everything which was beautiful was to be traced to the example of Mozart, and that the works of later times had the quality of killing the effect which they intended to produce; one mass of instruments overpowered another; and you lost all purity of tone and much purity of part-writing. He had not had the fortune to be at Bayreuth, but by the history of those performances it appeared very obvious that the master himself must have thought strangely of the effect he was going to present to his audience, since we learn that there was an abyss below the pit in which the orchestra was placed, so that this Persian army of monstrous sound might be deeply buried and be unable to obtrude upon the enthusiastic hearers. It was only by thus entirely burying the effect of such an extraordinary accumulation of instruments that it could have been possible for any voice to be heard, or for the sounds which these instruments themselves produced to have been articulated, unless they had been in the open air. He was strongly convinced that it was most desirable that every student should seriously inspect the music of such a composer, in order to learn that most valuable of all lessons—what to avoid. He had only had the fortune to hear three of Wagner's works in full, the only three given in this country, and some detached pieces, and upon them his very earnest conviction was based. It was of course a presumption to state an opinion which was at variance with the practice of a man whose power for evil as an art-influence arose from his very great genius. And the most serious mischief in the works he had given was the beauty they contained, since that beauty dazzled those who admired them, and blinded their senses to the imperfections which lay side by side with those glittering jewels. It was a presumption for which he must apologise, but it arose from so very firm a conviction, that to offer any remarks on this subject of instrumentation, without some such allusions as he had made, would have been to compromise himself.

Mr. Otto Goldschmidt, after endorsing the Chairman's remarks as to the admirable character of the paper, said he should not have risen to speak but from having had the honour of knowing both Mendelssohn and Schumann, with whom he lived at Leipzig whilst most of their works were performed for the first time. He could not help feeling that although perhaps Mr. Prout had not had those advantages, still he seemed to have divined exactly the development of those important compositions to which he had referred, the "Elijah" and the latter works of Mendelssohn. "Athalie" and the other works which appeared rather overcharged with brass were, he fancied, written under peculiar circumstances and for special occasions, and also when possibly a sense of lassitude and fatigue—he would not

call it decay—had come over the musical spirit of Mendelssohn. With reference to Schumann, although it would not be the fashion of the present age to admit it, he earnestly concurred with what Mr. Prout had said about his instrumentation; but one point had not been mentioned, namely, that Schumann began essentially as a pianoforte composer, and only developed into an orchestral writer. He should like to add that Schumann was one of the most earnest workers who ever lived. In 1850 and 1851 when he knew him in Hamburg, every morning he devoted an hour or two, and that was only within five years of his death, to musical composition, contrapuntal studies, and orchestration. He quite agreed with Dr. Macfarren in expressing his astonishment at the omission of Spohr's name. He hoped Mr. Prout would at some future time give them what he had alluded to—a special paper on Weber, for nothing could be more interesting or instructive. With reference to Wagner's orchestra and the performance at Bayreuth, he entirely differed with Mr. Prout and agreed with the chairman. He had heard the last performance of the "Ring des Nibelungen," and but for the subterranean arrangement of the orchestra, of the herculean singers whom Wagner had specially selected—for he had for years gone all over Germany to select herculean voices—not a note would have been heard of them. Probably Mr. Prout went down into that awful place, a perfect pandemonium as it was in the heat of August, for, when he was taken down by the leader of the orchestra, the heat was so suffocating that he found most of the professors playing in their shirt-sleeves. But for this circumstance, and the additional one that they had rehearsed for a great length of time beforehand, not a note of the solo singers could have been heard.

The Rev. Thos. Helmore said as an amateur he should like to say how much he had been delighted by the admirable paper, and he hoped that Mr. Prout would not only give them a paper on Weber, but also a third, filling up the gaps which he had been obliged to leave on the present occasion.

Mr. Chas. Stephens asked if the Chairman would say a word on the use of valve-trumpets in the orchestra.

The Chairman said no doubt this was an important subject. In the first place, he believed the valve itself deteriorated the tone of the natural instrument, for he had heard the same player play successively on a hand-horn and a valve-horn, and it appeared to him that the tone of the latter was far inferior. That, however, was of secondary importance; the significant thing was, that by the use of these valves you obtained the entire chromatic scale, and by this enrichment impoverished the orchestra in a lamentable degree. The orchestra was distinguished from the pianoforte by the variety of tones and the prodigious power of colouring which this placed in the hands

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of the composer. The use of early times to have complete bands or "consorts" of one kind of instrument had now given way to the blending of many qualities of tone one with another. Even this was anticipated in early times when the expression "broken music" implied the mixing of several "consorts" such as hautboys and viols, and viols or shawms. There were great beauties in the combination, and still more in the contrast of these several qualities of tone. In the scores of Mozart, Beethoven, Weber, and Spohr, it would be found that when trumpets, drums, and horns were used they gave a characteristic mark to the chords and keys in which they appeared, and when the music modulated from those keys you either lost those sounds altogether or else the instruments were employed on peculiar notes of peculiar chords, and thus gave a totally different character to the extraneous keys to that of the normal keys in which the pieces were set; or else when, as in the "Dona Nobis" of the Mass in D of Beethoven, the piece being in D the trumpets were pitched in B flat, a totally exceptional effect was produced from the introduction of instruments which were not employed in the normal key. The same was the case with the horns and trumpets in the slow movement of the C minor Symphony. The movement being in A flat, when they came in C, it was a totally new sound, and produced an effect which might be compared with that of the present gathering sitting in that room in the gaslight, and the roof being suddenly thrown open and the sun streaming in. On the other hand, when these instruments were employed which gave the chromatic scale, the composers who used them were tempted to apply them to any loud chord that was wanted; when they were not used in the degraded sense in which waltz writers used them to play the principal melodies, in order to force out, by manifold duplication of notes through the foggy mass of multitudinous instrumentation, a rampant vulgar tone upon the otherwise imperceptive organs of the hearers. This vulgar use, such as was commonly heard in entr'actes in theatres, was a thing quite apart from the beautiful delicacy, from the exquisite feeling, from the heavenly perfection of sound, which you found in those compositions which had been so well described and so warmly eulogised that evening. This employment of valve instruments tended to reduce the orchestra to the level of the pianoforte, which had the power of *piano* and *forte*, but could only have one quality of tone, that quality being only variable by the aid of a different touch. They knew that one player would produce a different effect from another on the same pianoforte, but it would sound a pianoforte all the way through; and the orchestra with the scarce notes of the incomplete wind instruments was a far richer power

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in the composer's hands than when there was the terrible temptation of writing for cornets like violins, or for horns like violoncellos. There was another instrument besides which was played mostly in England, for which he believed Mendelssohn intended such a passage as that at the end of the overture to "Ruy Blas"—a slide-trumpet. A slide did not deteriorate the effect of the instrument, as the valve did, just in the same way as a valve-trombone was inferior to a slide-trombone. He would earnestly caution young writers to confine themselves to such trumpets as Beethoven would employ.

Mr. STEPHENS was very glad to hear these remarks on the question of valve instruments. It was one deserving of consideration, and on which, no doubt, difference of opinion prevailed, for he thought instruments without valves, even in the simplest passages, sometimes caused failures in the effects intended. There were but three continuous notes of the scale on those instruments which could be used, and when you came to F on the fifth line and B flat they were out of tune, and required modification to make them at all bearable. Nevertheless, the chairman's remarks were most valuable, because the great effects of those instruments were produced by the simple use of them with their original power. He might allude to two very familiar instances—the slow movement in Beethoven's Symphony in D, in which the horns in E were used with such grand effect, and the barcarole of Sir Sterndale Bennett in his Pianoforte Concerto in F minor. In both these works the horns were used in the true way, and did not fail of their effect. The scores of Schumann, on the contrary, showed an abuse of these valve instruments, because he made use of them until at last they became ordinary instruments, and the colouring which they might impart—as in the works of Beethoven and Mozart—was lost.

Mr. BLAIKLEY, as a practical instrument maker, said he might make one or two remarks on this question. First, with regard to comparing a valve instrument with one which had no valves. It was not sufficient to take a valve instrument nominally of the same kind, say a French horn or a slide-trombone, and compare it with a valve-trombone; you must be perfectly sure that the calibre of the instruments in every portion, from the mouthpiece to the bell, was exactly the same, for, unless that were so, there was no guarantee that the difference which might be noticed was due to the addition of the valves. Some years ago, for the sake of experiment, he made a horn of brown paper on the same mandril as one used for a brass instrument. He had shown that to many brass instrument players well qualified to give an opinion, and none of them had been able to discover the difference in tone between the paper horn and the metal one of the same shape. But if a

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metal horn were compared with another differing even imperceptibly to the eye in the shape of the tube, the difference in tone could be detected by any musician. It was a matter which might require the expenditure of perhaps hundreds of pounds to determine mathematically whether the two instruments were exactly alike. Again valve-tromhones, as commonly made, were for the use of military bands, where power was the greatest requirement, and they were generally made with a greater diameter of tubing than the slide-trombones. If slide-trombones were made with the same diameter as the valve, there would be the same difference perceptible to the ear between the two slide-trombones as between the slide and the valve. These were little matters of fact which were commonly ignored by professional musicians and even players of considerable ability. A man was apt to base his opinion on the instrument he had played on all his life; he would take up another a little different, and at once find some difference, perhaps to the disadvantage of the new one. Thus, one player had a firm conviction that a silver cornet was better than a brass, and another had an equally firm conviction that brass was better than silver. This was simply because the instrument each had been accustomed to play upon was rather better than the one of a different material he happened to try. He did not think the valves necessarily injured the tone of the instrument. In early days no doubt, when the valves were much less perfect, they did destroy the tone, and the same was true of cheap common instruments in the present day. A remark made by Mr. Prout showed something of the same kind. He noticed the growing use of valve instruments in orchestral works, and also that Weber used clarinets much more frequently than Mozart. It would be an interesting question how much of that increasing use was due to the improvement of the clarinets between Mozart's time and Weber's by increasing the facilities of fingering, so that difficult passages could be taken much more easily; or, on the other hand, how far the requirements of composers had influenced the improvement of instruments.

Mr. Goldschmidt said there was little doubt that the more frequent use of the clarinet by Weber was due to the great friendship between him and Bärmann, of Munich, a great clarinet-player. He travelled with him for several years, and Weber wrote several concertos and duets for him.

Mr. Prout, in reply, said the omission of Spohr's name from his paper was partly accidental, but not entirely so. It occurred to him to mention his name, but when he came to think of the matter he did not feel that he had had so much influence on orchestration as some other composers, and therefore, being pressed for time, he omitted him. There was a great affinity between his scoring and that of Mendelssohn,

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though with some differences, especially in the treatment of trombones. He certainly should have noticed Haydn's use of the piano in the Symphony in B flat, but he was quite certain there was no piano indicated in that movement in the new German edition of his works, which was the only one he had seen. With regard to Wagner, there was no time to enter into the discussion; as to the noise of the Bayreuth orchestra, it must be remembered that Wagner had calculated on its position so as not to interfere with the scenic effect of the stage. With regard to valve instruments, on the whole, he should be most inclined to agree with the chairman; and if it came to a question whether they should use valve instruments as they were used nowadays or go back to the old ones, he should say take away the valves altogether, but happily they were not in that predicament. They had valves which were very useful in certain cases, for instance, the B flat and F, and he should rather say keep the valves, but be careful not to abuse them. Mr. Blaikley had said that there was no difference in the best instruments, whether with valves or without, and he could partly corroborate that opinion—not from his own knowledge, because he did not play a brass instrument—but he was tolerably intimate with one of the horn-players at the Crystal Palace, to whom he had spoken on this subject more than once, and he told him he did not believe any one could distinguish the slightest difference between the open note played on a good valve-horn and on a natural horn. A paper horn had been mentioned; and he might also refer to the fact that M. Mahillon, of Brussels, had constructed a trumpet of wood which gave a tone which nobody could possibly distinguish from that of a brass instrument.

A vote of thanks was passed to the Chairman for presiding.

February 3, 1879.

G. A. MACFARREN, Esq., M.A., Mus. Doc.,

Vice-President, in the Chair.

BERLIOZ.

By G. A. Osborne, Esq.

The paper which I have the honour of reading before you to-day, I have called a sketch, as it would be impossible for me to do more than touch slightly on some salient points of Berlioz' life, and I am glad of the opportunity of so doing, having enjoyed his friendship and confidence for many years.

There are some things I should like to tell you of concerning Berlioz, as a man apart from the artist, but, as in his biography written by himself, some years prior to his death, he has refrained from touching on them, I must not draw aside a veil which he has kept closed.

In 1848, Berlioz, who was much dissatisfied with the biographical notices of him that had already appeared, and fearing that others, already announced, would be equally full of errors, determined to give an account of his laborious life, which was a truly agitated one. His wish was to offer a retrospective study to composers, enlightening them as to difficulties which beset their career, and helping them with advice, the fruit of his own experience. At this time he had already published a volume containing fragments of musical criticism, and a narrative of his travels, but, being importuned by many friends, he determined to write his life; and in the preface he says, "It is better that the public should know the truth from me than be confirmed in what is inexact, although for them it will be little matter what I say, think, or feel."

At this time the Republic was proclaimed in France, and nearly all the thrones on the Continent were threatened with the revolutionary wave which was then passing over Europe. The arts at such a period do not flourish, and Berlioz could not hope to benefit himself in France or Germany, so he thought of England, where he was received with a noble and cordial hospitality,

Berlioz was born in a small town, La Côte St. André, on the 11th of December, 1803. His mother, as he says, did not dream, as did the mother of Virgil, that she was to bring forth a branch of laurel, so he made his appearance in all simplicity, without any precursory signs, which in poetic times were the forerunner of those predestined to glory. In his early years he attended all the ceremonies of the Roman Church with assiduity, and weekly he confessed to the director of his conscience that he did nothing, to which the good priest replied, "My son, continue to do the same thing." At the age of ten, Berlioz was put to school, but soon after his education was undertaken by his father, a doctor of medicine, a clever man, and much respected by all who knew him. He could not get his son to commit to memory pages of Horace and Virgil, but he could tell you of Java, Borneo, the Sandwich and Philippian islands. His thirst for information respecting foreign lands was extreme, and had he lived near a seaport, he would, most indubitably, have been off to sea, with or without his father's consent.

Berlioz was violently in love when twelve years old, and he considers no after-love sufficiently strong to efface the effect of the first passion. In this he does not agree with Goethe, who says that a man can find himself in no position so delicious as between a love that is ending and one that is beginning. At this time his father undertook to teach him, in conjunction with his other studies, the rudiments of music, as well as the proper fingering of the flageolet, an instrument discovered in an old wardrobe, much to the discomfort of those under the parental roof. His proficiency on this instrument was so great that his father was induced to bring over a professor from Lyons, who settled at La Côte St. André, with the appointment of *Chef de Musique de la Garde Nationale*. From this gentleman Berlioz received daily two lessons: his progress was rapid. He had a sweet voice, was an intrepid reader, and performed on the flute some of Drouet's most complicated pieces. Having had some lessons on the guitar, he delighted in finding out a succession of chords. His great desire was to compose, but, although he passed nights in studying a treatise on music by Rameau, he found it too obscure. He tried to arrange duets and trios, but could not, as he jocularly says, find either chords or bass that had a grain of common sense. Being more successful in his study of Catel's Harmony, and as he had frequently heard Pleyel's quartets performed, he ventured on the composition of a quintet, for flute, two violins, tenor, and bass. The enthusiasm of the performers was great; but not participated in by Berlioz' father, who reserved his applause for a second quintet, which was tried two months later. Now at this time, the young composer not being thirteen years old, this

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account of himself does not agree with one of his biographies, wherein it is stated that he was twenty before he began to learn his notes. With such discrepancy, we cannot be surprised that he was induced to speak for himself. These two quintets were burned by him some years afterwards in Paris; but, in his overture to the "Francs-Juges," the theme in A♭, after a few bars of introduction, played by the first violins, is the one approved of by his father, who, on hearing him play it on the flute, exclaimed, "That is music indeed."

Berlioz was not permitted to learn the piano, fearing that he might augment by one the 40,000 celebrated performers on that instrument supposed to exist in France, besides which, his father was anxious he should become a doctor, so as to take his place at some future day.

His first essays in musical composition were uniformly in minor keys, and profoundly melancholy. His juvenile thoughts seemed draped in crape, which he attributes to his ardent early love. Reading the lives of Gluck and Haydn threw Berlioz into ecstasy. Up to this time he had never seen a full orchestral score; but now a thousand combinations suggested themselves to his mind, and he at once resolved to devote himself to the divine art, and throw physic to the dogs. As his father was bent on his pursuing his medical studies under the guidance of a friend, a surgeon in Paris, he was sent there, having made considerable progress in the study of anatomy under his father, who, with the aid of large engravings and an old skeleton, did much for him. In Paris he had for fellow-student a young man who played the violin; consequently many hours which should have been devoted to Esculapius were spent in playing duets. In 1822 he walked the hospitals with his fellow-student, but the more he walked in compliance with his father's desire, the greater was his aversion to the study of medicine, and particularly to the dissecting-room, which positively affected his nervous system. Having heard Gluck's opera "Iphigénie en Tauride," he was so struck with its beauty and power, that he resolved at once to write to his father, informing him that no entreaty of father, mother, grandfather, grandmother, uncles or aunts, could in any way influence him in his determination to be a musician.

Although he had already made up his mind respecting his future career, still he had only now informed his father of his final resolve, which resulted in a correspondence most painful to both. At this time Berlioz was introduced to Lesueur, who was musical director of the Chapel Royal, where a mass was performed every Sunday before Charles X. He was kindly received by him, and, after examining a canon and cantata recently composed, he was told that his harmony was against all rule, but that he would receive him into his class after preliminary study under his chief pupil. In a few weeks he

was received by Lesueur, who was much pleased with his attention and rapid progress; but, although Berlioz acknowledges the many acts of kindness received from his master up to the time of his death, he also laments over the time lost in learning and unlearning his antediluvian theories. The first work of importance by Berlioz was a mass to be performed at St. Roch, with an orchestra of one hundred selected instrumentalists, and a more numerous chorus. At the rehearsal there was only one oboe, one horn, and one bassoon—in fact, not one-third of the promised number put in an appearance; but, as he was assured that all would be right on the following day, the rehearsal began. After a few bars the strangest chords were heard, which drove Berlioz nearly wild. In vain he cried out "B flat, C sharp," on they went, making a fearful noise, till he rushed on to the platform crying out, "Stop! stop!" On examining the parts, which, to save expense, were copied by amateurs, it was found that the accidental sharps and flats were left out, with numerous other mistakes. The mass was withdrawn, and, for a time, the composer had to wait for the realisation of his most ardent desire, that of hearing a work of his performed by full band and chorus.

Having made important changes in his work, and having copied out all the parts himself, not wishing to trust unpaid artists, he wrote to Châteaubriand requesting the loan of £50, which the great poet refused, with that courtesy and regret which usually accompany answers to such epistles. Berlioz persisting in disobeying his father's wishes, his monthly allowance was withdrawn, so he was in despair, when one evening he found himself at the Opera seated next a young man whom he had remarked at the memorable rehearsal already noticed. In conversation Berlioz told him of his want of means and the refusal of the £50; upon which the young man exclaimed, "Is that all? You shall have £80, in fact, any sum you require." The offer being accepted, the mass was performed, and favourably received. In 1827 it was again performed at St. Denis, the orchestra and chorus giving their service gratuitously. Having now acquired much experience, he was so dissatisfied with his work that he burned it with other compositions, beholding the flames with the joy of an inquisitor. Cherubini, who was then director of the Royal Academy of Music, wishing to keep the lady and gentlemen students apart, had assigned to them a different entrance to the college, of which Berlioz was not aware, being only recently admitted as pupil to the classes. One morning, going to the library by the forbidden door, he was refused admittance; an altercation ensued, when Berlioz, sending the doorkeeper to some objectionable place, which was not precisely Jericho, passed on triumphantly. Cherubini being informed of this, went at once to the library in a great rage,

with several attendants, when a comical scene took place; a regular chase; stools and desks knocked down amidst much laughter, Berlioz exclaiming, "You shall not have me nor my name." The fact is there was no love lost between Cherubini and Berlioz, who says of him, "Often has he made me swallow serpents, obliging me now and then to treat him with a few rattlesnakes." The favourable mention of Berlioz in the journals had in some degree mitigated the aversion of his family to the musical profession, but this aversion redoubled when, after a preliminary examination, his name was eliminated from the number of candidates selected to compete for the prize which entitled the winner to a government pension for three years, to be spent principally in Rome.

A visit to the parental home, at this moment, foreboded no good to Berlioz, but, being the vacation, he went there. No entreaty of his father had any effect on him to give up music for medicine. On bended knee his mother supplicated him not to disgrace his family by becoming a second-rate musician, though she felt no scruple at his becoming an indifferent doctor, doing that harm with drugs which crotchets and quavers do not aspire to. Berlioz was obdurate, and unfortunately received a mother's curse. The first idea of Berlioz, on his return to Paris, was to pay back the sum lent to him by his generous friend; but how was it to be accomplished? The small sum gained from lessons on the guitar and flute, at a franc a lesson, together with a salary of 50 francs a month as chorister in a small theatre, and a trifle for copying music, was not sufficient; so he economised on his daily personal expenditure, which, in the purchase of bread, dried raisins, dates, and milk, enabled him to repay half of the sum lent to him. There being no professor of instrumentation at the Royal Academy, his knowledge on that head was derived from perusal of full scores during the performance of works by the great masters. From Reicha he learned counterpoint and fugue. One day he asked the celebrated professor what he thought of vocalised fugues on the word Amen. "C'est de la barbarie," was the reply, which coincided with his own idea that such fugues are grotesque abominations. At this time, Habeneck, the conductor of the concerts at the Conservatoire, was doing his best to imbue the artists with his enthusiasm for Beethoven. Berlioz, who worshipped this great genius, was anxious that his master, Lesueur, should give him his opinion of the C minor Symphony, which was then to be performed. At the termination of the concert he waited for his master, who, on seeing him, cried out, "Let me pass, I want air, 'tis marvellous! Leave me, and see me to-morrow." Notwithstanding the immense effect produced on Lesueur, Berlioz was anxious to have the opinion of his master after a night's rest, which was, that music must not be composed like

that; to which Berlioz replied, "Be assured, very little of *such* music will be produced." It is a curious fact that Haydn was persistent in calling Beethoven merely a great pianist. Grétry, in speaking of Mozart, says, he placed the statue in the orchestra, and the pedestal on the stage. Handel asserted that his cook was more of a musician than Gluck, and Rossini, speaking of Weber, said he gave him a stomach-ache. Shakespeare, although only known to Berlioz through a French translation, had wonderful power on his nervous temperament. He speaks, in his biography, of the miserable sleepless nights he passed after reading the great poet's plays, which he was then going through, and he asserts that he had refreshing sleep but four times, and that only after fatiguing his body by long walks. Twice he slept profoundly in a meadow, once on the frozen Seine, and again on a table in the Café du Cardinal, where he remained five hours without waking.

If the reading of Shakespeare had such an effect on his organisation, we cannot be surprised at his saying that the great drama of his life had begun after seeing Miss Smithson in Ophelia. I assisted at this representation of "Hamlet" in Paris, and never before nor since was a greater success achieved on the French stage, or greater unanimity of highly eulogistic praise in the press. Not knowing a word of English at this time, and Shakespeare only through a mutilated form and a poor translation, it was the dramatic genius of Miss Smithson that produced such a wonderful effect on his heart and imagination. He wrote letters to her which remained unanswered.

Miss Smithson was much admired and sought after. I remember being at a public ball, and while walking with her leaning on my arm, we were stopped by Mdlle. George, the great French tragedian, who took my other arm, making me look like an urn with two handles as we paced up and down the room. Many were the winks and nods I received; one gentleman loudly remarking, "Look at that monopolıser of tragedy."

In a benefit for a French actor, two acts of "Romeo and Juliet" were to be performed, and Berlioz, wishing to draw Miss Smithson's attention to him, got the director to announce an overture of his to be played between the acts. During the rehearsal Berlioz entered the theatre, and seeing Romeo carrying out Juliet, he uttered a shriek, and with outstretched arms rushed out. Miss Smithson saw him and recognised her admirer; being much frightened, she requested those about her to watch him, as his eyes betokened no good. At night his overture was performed; but, though applauded, was not encored. Miss Smithson, who was in her dressing-room, neither heard it nor inquired about it. Berlioz at last, after two fruitless attempts, gained the prize which was to send

him to Rome; and here I may mention that the prize awarded by the musical section of the Academy must be ratified by a majority of votes given by sculptors, painters, and engravers.

In July, 1830, during the fighting on the three memorable days, he was engaged in instrumenting his cantata of Sardanapalus to the sound of cannon and musketry, which probably suggested some *confused* passages. On the 29th, having regained his liberty, he promenaded the streets, pistol in hand, with a band of Orphéonists, celebrating the triumph of people over king. His cantata was performed soon after at the Institute, and, as at the rehearsal, the tone-colouring of the conflagration scene produced immense effect; it was anxiously awaited for; unfortunately, the horn which was to give the signal for the entering of drums and cymbals during a *tremolo* for violins and basses, forgot his counting and was afraid to come in. Berlioz, who was seated behind the conductor, rushed off the stage, upsetting several desks and a chair on which Madame Malibran was sitting. The consternation of audience and performers was great, and many were the jokes circulated respecting the failure of the musical conflagration; soon after Berlioz took his departure for Rome. Some time after his arrival in that city he received a letter exasperating him to such a degree that he determined to proceed at once to Paris, commit a double murder and then a suicide. Armed with two pistols, laudanum, and strychnine he set off on his journey. At Florence he purchased a woman's costume so as to introduce himself unknown to his destined victims. Travelling, fortunately, at that time was not so rapid as it now is, and reflection brings counsel. So it was with Berlioz; he did not go to Paris, but from under the ramparts of Genoa he was rescued from a watery grave in the Mediterranean. His memoirs do not tell us whether his fall was premeditated or accidental. Soon after Berlioz took his departure for Rome, and there he was in ecstasy with the sublime works of Michael Angelo, Raphael, and Canova. He trod on marble and mosaic of the rarest beauty. In the midst of all those arts, so full of life, majesty, and grandeur, he saw music brought to the level of a degraded slave. After spending the required time in Italy, where he certainly was not studying music, but rambling about the country, he returned to Paris, where he found Miss Smithson, who, after a prolonged absence from the French capital, was giving representations of Shakespeare's plays, having secured a theatre, and engaged a company at her own risk and peril. By a curious fatality he lodged opposite the residence of Miss Smithson, and seeing her from his window go in and out, his former passion was rekindled and burned bright for Ophelia. He was now presented to her, and soon began to experience all the annoyance that a proposed matrimonial

alliance brings about from those whose feelings on the subject are not in consonance with our own. As love laughs at locksmiths, the opposition he encountered made him the more determined to marry the object of his passion. The speculation entered into by Miss Smithson was a failure; the fickle French public no longer came to worship at her shrine, and, as she had the misfortune to break her leg when stepping from a carriage, the theatre had to be closed. For some months she was laid up, and though sufficiently recovered to appear in the mad scene of Ophelia at a benefit organised for her, still she was uncertain of her movements, and the great success she was accustomed to receive passed from her on that night to Madame Dorval, who performed in one of Dumas' pieces. This representation only produced a sufficient sum to pay the most pressing claims; and when Berlioz married, he not only made himself responsible for outstanding debts, but on that day, to begin his honeymoon, he had only £12 in his pocket, which was lent to him by a friend. After a few years his married life was far from being a happy one, owing to an uncontrollable jealousy of a lady who eventually became his second wife. One evening after dining with me, we conversed on the usual painful subject, and, as I saw but one remedy, I frankly told him of it. Much to my surprise, he sat down and wrote a charming letter of adieu to the lady, which he left at her lodgings when walking out with me. Next day he told me that he had gone back to the house, took the letter from the servant and tore it up, his courage having failed him. In December, 1838, he gave a concert in Paris, at which was performed his symphony of Harold. At the termination of the concert, Paganini, who was suffering from a disease in the larynx, of which he eventually died, and whose voice was then scarcely audible, whispered something to his young son, who thus addressed Berlioz: "My father desires me to tell you that never during the course of his life has he experienced such emotions as he felt this evening on hearing your music, and he can scarcely refrain from kneeling to you while proffering his thanks." At these strange words, Berlioz made a gesture of incredulity, at which Paganini with effort cried out, "Yes! yes!" and then in the presence of many artists he knelt before Berlioz and kissed his hand.

On the next day he received the following letter from Paganini:—

My dear Friend,—

Beethoven dead, Berlioz alone can revive him, and I, who have tasted your divine compositions worthy of a genius like yours, deem it my duty to beg, as homage on my part, your acceptance of 20,000 francs, which will be delivered to you on presentation of the enclosed.

Believe me always yours affectionately,

NICOLO PAGANINI

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To this letter Berlioz sent the following reply:—

O noble and great artist, how can I express my gratitude!!! I am not rich, but, believe me, the praise of a man of genius like yours touches me a thousand times more than the royal generosity of your present. Words fail me; as soon as I can leave my bed, where I am confined, I shall hasten to embrace you.

H. Berlioz.

The Harold symphony owes its origin to the following: Paganini possessed a magnificent Stradivarius tenor, and, wishing to play it in public, he asked Berlioz to compose a solo for him, as he was too unwell to do so for himself. To please the illustrious violinist, he wrote a solo combined with the orchestra in such a way as not to interfere with its action, knowing full well that Paganini would be able to make the tenor part a great feature by his incomparable talent. When the first part of the symphony was finished, it was shown to Paganini, who, seeing the number of bars' rest for the tenor, said, "This won't do; I must be always playing." A few days after he went to Nice, and only returned to Paris three years afterwards, when he heard Harold for the first time. On the 23rd of November, 1834, this symphony was brought out by Berlioz at his concert, and, although it achieved a complete success, still the work was reviewed in a musical paper, and turned into the greatest ridicule. The article began thus: "Ha! ha! ha! Haro! Haro! Harold!" The next day he received an anonymous letter reproaching him with want of sufficient courage to blow his brains out. Berlioz saw himself caricatured and turned into ridicule in every possible way. At a masked ball, Arnal, a celebrated comic actor, harangued a group before him, exclaiming, "I am the great musician who, unaided by poetry, prose, scenery, and costume, can express everything, even as to how a man may tie his cravat, and that only with the aid of 350 musicians. Compare me to Rossini, who, to make his reputation, is obliged to have his music played in the four quarters of the globe. I tell you, gentlemen, he is an impostor; his music produces no effect, absolutely not a particle of effect; that is the effect it produces on me."

There is a turning point in the lives of men, and such was now the case with Berlioz. He was so indignant at the non-recognition of the great masters, and the fulsome praise bestowed on the sensuous music of the Italian school, that he determined to do battle in the press with those who were daily proclaiming that the end of music was merely to charm the ear. His first exclamation when beginning his article was, "Ah! wretches, I hold you now." He deceived himself, he held nothing. His inexperience of journalism was great, and his musical proclivities violent. When the editor of the *Quotidienne* read the article which he had asked for,

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he was surprised at the audacity of the attack, and said, "This won't do; it is perfectly true, but you are breaking windows, and I cannot accept your article." Berlioz could remain for hours over a score, but he disliked spending any time over a musical critique, and in this instance he did not comply with a request to modify his article. When he became musical critic of the *Journal des Débats*, he says it took two or three days to write an article, and, when finished, his copy was full of blots and erasures. Musical composition for him was a natural function, a happiness; prose writing a labour without love. I have heard him say he would rather be a porter of a double-bass than a musical critic, if he could get as well paid for it. Although his articles, full of admiration of Gluck, Spontini, Beethoven, and Weber were most favourably received, still he began to realise the difficulties and danger of his position as composer conjointly with that of musical critic, and which, as he says, exercised so great and so deplorable an importance in his after-life. For enemies he had, not only those great conservatives who detest innovation of any kind, but also those who fell under his lash, of which he was not sparing. His most bitter enemies, however, were probably those whom he did not sufficiently praise according to their estimation of their talents. We can easily imagine the effect of his music on an audience thus composed. Berlioz had some friends he was much attached to, and one of them was Adolphe Nourit, principal tenor of the Grand-Opéra, where he was a great favourite. After his last performance, before the appearance of Duprez, I walked with him and Berlioz, who, seeing him much depressed, strove, as I did, to persuade him that after Duprez success, which was anticipated and fully realised, he would, on his return from Italy, be welcomed with enthusiasm. He wished to believe us, but did not. Soon after, he appeared in Naples in one of his favourite characters, and was warmly applauded, but unfortunately he heard a slight disapproval of the applause, which unnerved him. He returned home, supped with his wife, then retired to rest, and without any idea on her part that there was anything wrong, he left her sleeping, and, going to a balcony on a terrace, threw himself off, and was killed on the spot.

At this time, Berlioz, who had hitherto entrusted his compositions to Habeneck, Valentine, and others, set now to conducting them himself, and announced a grand concert, at which Cherubini being requested by a friend to attend, refused, saying he did not want to know how music should not be composed. Those who give orchestral concerts know well the difficulties with which they are beset, and how seldom it is that even a small profit is realised after the expense is paid. Keeping this in view, we can easily imagine how Berlioz often found himself in embarrassed circumstances. During his

concert-giving tours in Russia and Germany, he had to send to the *Journal des Débats* an account of his travels, which he did in a series of letters to several friends, which are to be found in his biography, one of which he has honoured me with. At the end of a letter addressed to Stephen Heller, he says, "Continue to write charming pieces, and may Heaven preserve you from fugues with four subjects on chorales." The physical and mental organisation of Berlioz accounts for much of his startling originality; his intellect was keen, his will violent, and his tenacity of purpose excessive. As a composer, Berlioz had a bold innovating spirit, possessing marked individuality in the romantic school of music. His whole life was one desperate struggle for the triumph of a system of musical poetry. He was a great champion of what is termed programme music, but the best specimens of his instrumental works are those in which the music speaks for itself. Nothing can be more exquisitely tender than certain of his songs and choral pieces. He has left on record a problem to be solved: "Which has the greatest power in elevating a man to the sublimest height, music or love?" He thinks that love cannot give an idea of music, but music can give an idea of love—they should not be separated, being the two wings of the soul. Notwithstanding the first-rate beauties to be found in the scores of Wagner, in speaking of the school of the future, he says, "If such is this religion, it is exceedingly novel, I admit; but I am far from professing it. I never did belong to it, I do not belong to it, and I never shall belong to it. I raise my hand and swear, '*Non credo.*' There is one thing I believe firmly: the beautiful is not horrible, and the horrible is not beautiful. It is not, no doubt, the exclusive effect of music to be agreeable to the ear; but it is a thousand times less its object to be disagreeable to the ear, to torture and to flay it." This profession of faith, solemnly uttered, horrified the adherents of the new school, who, regarding Berlioz as its high priest, denounced him as a traitor. Few persons have been more misappreciated than he was in his own country, though received everywhere else in triumph. He may be said to have died of the systematic disdain of his countrymen, which, to a man of his superior genius, was most revolting. The stereotyped commonplace flattery from commonplace men was hateful to him. In Vienna he was offered a permanent and lucrative appointment, which he refused, as by its acceptance he could not travel where he liked. In London his engagement for three years as conductor at Covent Garden was very satisfactory, as it did not interfere with his visits to Paris and elsewhere. Unfortunately, Jullien became bankrupt. His visits to London were always agreeable to him, and his praise of English artists most enthusiastic. He was not fortunate

with his operas, and the failure of the last, "Les Troyens," considerably affected him. During the following six years he suffered much, both mentally and bodily, and the death of his son, which happened during that period, caused him the deepest sorrow. By the advice of his doctor he went to Nice, which town he always visited with pleasure; but one day, falling down from weakness, he was much cut, and was taken bleeding to his hotel, where he remained confined to his bed for some time. On his return to Paris his friends were horrified at the great change they saw in him; he sometimes lost his memory, and forgot the names of his most intimate friends. The last time he gave any sign of intellectual life was on the 17th of December, 1868. On that day paralysis struck him dumb, and the words addressed to him remained unanswered. By one of those returns to life to be met with in men of nervous constitutions, he took from Madame Charton an album, traced in it a dozen bars, and wrote the words and music of one of his earliest melodies, "*Reviens, reviens, ma bien-aimée.*"

At the age of sixty-six, on the 8th of March, 1869, Berlioz died. At the very moment that he was breathing his last a telegram was received from Moscow announcing the success of his opera, "Les Troyens." A funeral service, consisting of music by Mozart, Cherubini, and his own, was performed in the church of the Trinity, and his mortal remains were accompanied to the cemetery of Montmartre by a deputation from the Institute, of which he was a member, the procession being headed by a band of the National Guard, playing appropriate pieces from his compositions. Sorrowing friends bade him a long adieu at the brink of his grave. I have not touched on the works of Berlioz; men more competent than I am are constantly reviewing them, and will continue to do so, for tardy justice is now being done to him, and his works are heard in every country where an efficient orchestra is to be found. If time permitted I should like to tell you much more about Berlioz; but if I have interested you in this slight biographical sketch of a departed friend, my object will have been amply obtained.

DISCUSSION.

The CHAIRMAN proposed a vote of thanks to Mr. Osborne, which was carried unanimously.

Mr. MCCAUL wished to ask Mr. Osborne whether the composer of whom he had been speaking wrote a School for the Violin. He should also like to know if the story he had heard with reference to the removal of the bones

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of Berlioz's first wife from the cemetery was correct; also if his opera of "Benvenuto Cellini" was a success on the Continent.

Mr. C. STEPHENS asked if the last speaker was not thinking of Baillot as the author of the Violin School he alluded to. He never heard of one by Berlioz.

The CHAIRMAN inquired if there was any one else who had anything to ask or any remark to make; was there no one present who had something to say about this very remarkable musician beyond expressing admiration for the excellent paper they had heard? Were there no reflections to be added on his strange aspirations to assert himself in a new musical form—to produce musical ideas in an idiom totally untried before; nothing to recollect of how many persons had said, as Paganini did, that at the death of Beethoven music was still to continue in the works of Berlioz? His music had not been played enough in England for very confident opinions to be stated respecting it, but speculation must be active, and curiosity and interest could not be dormant on a subject which had attracted the attention of the whole musical world. Berlioz had certainly musical genius, but it seemed more especially to have tended in the direction of musical colouring; and the attention he seemed to have given to this art of combining different qualities of sound had brought it to a more definite theory than perhaps any previous composer. He even went to the extent of calculating the exact balance of tone by the number of players that were to be engaged in each part in a score. It was not enough for him to write for first and second violins, but he prescribed how many should play each part; and in other of his orchestral directions he was equally minute. This led one to suppose that he must have calculated with a careful nicety the exact proportions that were required to realise the effects which floated in his mind. Perhaps, however, this was a dangerous calculation, because the different strength of tone of various players might counterbalance the difference of numbers—and it might well be that eighteen violin-players in one town would have a very different amount of power to the same number in another; and the prescription that there should be sixteen, eighteen, or twenty first violin-players, would be but a vague direction after all. It was, perhaps, even to be regretted that his thoughts should have passed into such minutiæ of theory, which could be little more than practical visions, which fact could scarcely interpret and realise. These biographical particulars concerning the man Berlioz led one to muse upon the curious problem of his artistic mind. The enthusiasm which he had for music seemed strangely to diverge from the faculty of musical production in the line in which it had been exercised by most of the men whom he himself, as well as the world at large,

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was delighted to admire. One rarely found in his music those remarkable compounds of melodic interest and that complete grasp of harmony which were the main charms in musical composition, and for contrapuntal ability he seemed, from the words quoted, as much as from the absence of it in his works, to have had rather a dislike. So far as a small acquaintance with his productions enabled the speaker to guess at the ground-work of an opinion—for he could not be said to have formed one—he should suppose that his main thought in music was in this department of musical combination. It was very remarkable indeed that with the particular attention he gave to that, and with the result of that attention, not merely in his works but in his elaborate Treatise on Instrumentation, he should have had very small means to prepare himself for the task of writing on instruments or for instruments. For the speaker believed that, except the flageolet, flute, and guitar, he could play no instrument whatever, and yet he treated theoretically in his book on the manner in which other musical instruments should be handled by the musical composer. It was not, therefore, to be wondered at that there were some things in his treatise at variance with the mechanical facts; and whereas that book had been held in great respect, and still would be so, on account of the very high imaginative qualities it displayed and the strong feeling which it uttered in words, on the beauty of orchestral combination—still he thought it had mainly held its place as a text-book in this country because there was no other, and that the work which was now before the world by Mr. Prout would go very far indeed to supersede it, for English use at any rate. They must all regard with respect that treatise of Berlioz, but he was happy to think that in this art of instrumentation we had now a work of our own which would be still more valuable, which was thoroughly practical, and founded on a knowledge of the instruments themselves, so that it would not mislead any one by speaking of uses that were not known in this country.

The Rev. T. Helmore said he supposed every one knew the story of Berlioz attending the service at St. Paul's when the Charity children sang there.

Mr. Osborne said on that occasion he read out of the same book with him. He got two tickets from the organist, and they both put on their surplices and sang.

The Rev. T. Helmore asked if it were true that he was dissolved in tears on that occasion.

Mr. Osborne said it was quite true. He said never during the whole course of his life had music affected him in the same way as the singing in unison of those children.

Professor Monk thought it would be interesting if Mr. Osborne could tell them whether in the course of his career Berlioz ever had, to any great extent, opportunities of

trying in practice the combinations often so minutely pictured out in his mind—whether he was ever able to assemble together such bodies of instrumentalists and choralists as he described, or whether they were merely efforts of the imagination.

Mr. STEPHENS said a great many points referred to were such as he had an opportunity of trying, such as the minute directions he gave as to the materials of which the head of a drum-stick ought to be constituted, and things of that kind, or where he wished the clarinet to be enveloped in a bag so as to produce a distant sound; but he could hardly think it would be in his power to accurately try the effects of the numbers in the orchestra. It would scarcely fall within the power of any man to do that.

Professor MONK said many of his directions were on a gigantic scale.

Mr. STEPHENS said that in one place he gave orders for about forty pianofortes in an orchestra.

Mr. BOSANQUET said that probably no one present had heard many of Berlioz's works performed, but most likely Mr. Osborne had heard many of them, and he should be glad to have some little description of any that struck his memory.

Mr. OSBORNE said he was sure the meeting would thank him for having said nothing with regard to the works of Berlioz. He had felt sure that the Chairman would honour them with his presence that afternoon, and he knew that no one was better able to give the real character of his works. In the first place, in an "Imperial Dictionary of Universal Biography," there was an account of Berlioz' works, by "G. A. M.," in which he described many of the works up to the time when he was preparing his opera, in five acts, of "Les Troyens." He would not, therefore, attempt to deal with that part of the subject. They had heard some very interesting remarks on the balance of power which Berlioz had given such minute directions about. As to the opera of "Benvenuto Cellini," it had no success either in Paris or in London, but, strange to say, it had a most remarkable success in Weimar; in fact, its success there was as remarkable as its failure had been in London and Paris: so much so, that there was a dinner given to Berlioz, and songs were sung in chorus in his honour in French and German, besides which three verses in Latin, to music composed by Raff. As regarded the removal of his first wife's bones, he related the story in his own Memoirs. It was a very ghastly one, and he could scarcely relate it—he certainly could not do so in the terms in which he himself described the scene. Alexandre, the manufacturer of harmoniums, was a great friend of Berlioz, and at the death of his second wife, seeing that she had a very simple tomb at Montmartre, he bought a piece of ground, and had a vault

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and tomb constructed, which he made a present of to Berlioz. Berlioz, therefore, had to assist at the disinterment of his second wife, whose remains were placed in this new tomb. Eight years afterwards it was decided that all the bodies should be removed from the small cemetery of Montmartre, as the churchyard was to be utilised in some other way, and Berlioz received a summons to see that the remains of his first wife should be disinterred and removed. He, therefore, one grey morning, as he described it, proceeded alone to the cemetery, where there was one of the civic guard waiting for him. A new coffin was lying at the top of the grave, and on his arrival the gravedigger went into the grave to remove the coffin; in raising it the lid gave way, and the remains were exposed to view. The head became detached, the gravedigger took it and placed it in the coffin, and then went back and took up the remaining portion—enshrouded as it was in the grave-clothes—and placed it in the coffin also. Probably, Berlioz at that moment remembered the words of Shakespeare: "Alas! poor Yorick," for when he saw the gravedigger with the head of his wife in his hand, he said, "Alas! poor Ophelia." The disinterment having taken place, he followed the remains of his first wife to the new vault, where his two wives are now deposited. With regard to the number of stringed instruments taking part in an orchestra, Berlioz was very particular, giving the number of violins, tenors, and basses which he considered necessary for the balance of power; and, most certainly, he selected the best instrumentalists he could get. With regard to his knowledge of instruments, there was no one more severe on himself than he was: for, as he has stated in his Memoirs, he burnt many works after they had been performed with success. It was his constant habit to go into orchestras and sit with the different performers, watching them and turning over the pages for them. In this way he learnt the capability of each instrument; besides which he got several instrumentalists to come to his house, where they played together little things which he wrote for them to see what they could accomplish. For instance, he had asked both Chopin and himself whether such and such passages could be played on the piano; in fact, he neglected no opportunity of making himself acquainted with all that practically could be done.

Professor Monk moved a vote of thanks to Dr. Macfarren for presiding, which was carried unanimously, and the meeting adjourned.

[Since the above was in type, "Benvenuto Cellini" has been revived at Hanover, under the direction of Dr. Hans von Bülow, with indubitable success.—G. A. O.]

March 3, 1879.

JOHN STAINER, Esq., M.A., Mus. Doc., Oxon.,

IN THE CHAIR.

ON THE EARLY ITALIAN AND SPANISH TREATISES ON COUNTERPOINT AND HARMONY.

By the Rev. Sir F. A. Gore Ouseley, Bart., M.A., Mus. Doc.

PROFESSOR OF THE UNIVERSITY OF OXFORD, PRESIDENT OF THE ASSOCIATION

The object of the paper I am about to read is to introduce to your notice some of the principal Italian and Spanish treatises on music of the fifteenth and sixteenth centuries. It is a subject which has never been much attended to in this country, probably on account of the excessive rarity of the works in question; but which possesses a great deal of interest, when viewed in connection with the History of Musical Art. In order to illustrate the subject more fully, I have placed on the table a few of the rarest of these ancient treatises, from my own library, in hopes that some of those who are here to-day may care to examine them, and thus verify the observations I shall have to make concerning them.

In order, however, duly to appreciate the merits of these old writers, and indeed in order to enable us to understand their point of view at all, it will be necessary for me to go back to a very much earlier period, and give a rapid sketch of the progress of the art in early mediæval times. The great text-book, to which all the mediæval theoretical writers on music are indebted for their main facts and principles, is the celebrated Treatise of Boethius, and I will give a short sketch of him and his book ere we proceed further.

Anicius Manlius Torquatus Severinus Boethius was born in 470, at Rome, and was eminent for his virtues, his talents, and his misfortunes. Theodoric the Goth made him his chief minister and adviser, which office he retained for many years,

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besides being three times consul. After a time he lost favour, and was imprisoned for life, and ultimately killed, in 526. Among his various works the only one which concerns us to-day is his treatise on music. This is in five divisions; of which the first gives a general description of ancient Greek music, the formation of the Greek modes, the Pythagorean proportions of intervals, and the order of notes in the scale. The second still further expands this subject, especially as regards intervals. The third gives an analysis of the systems of Aristoxenus, Architas, Philolaus, and others who differed from Pythagoras. The fourth treats of the ancient Greek notation, and the divisions of the monochord. The fifth goes into a detailed comparison of the system of Ptolemy with those of Pythagoras, Architas, and Aristoxenus. Boethius is a thorough Pythagorean in his musical doctrines throughout, and his work is nothing but a Latin exposition of ancient Greek systems, founded on the old tetrachordic method, and treated after a mathematical and speculative fashion. Still, his work was the only text-book for well nigh 1,000 years on most musical points, though of course the discoveries and inventions of Guido and others modified its application as time went on. The copy of it on the table is the earliest printed edition published at Venice in 1491. Now, it is evident that no one could learn to compose music, in our sense of the words, by studying Boethius. All he could learn would be a certain amount of knowledge of ancient Greek systems, speculations, and notation of pitch. And I think most people will endorse Dr. Burney's dictum, which is as follows:—

He says, "I cannot quit Boethius without observing that his tract on music (which to read was long thought necessary to the obtaining a musical degree in our universities, and which with great parade has been so frequently praised, quoted, and pronounced by writers on that art to be of the greatest importance to every musician,) contains nothing but matters of mere speculation and theory, translated from Greek writers of higher antiquity; which, if necessary to be known at this time, would be more profitably studied in the original: but the theory of every art being vain and useless, unless it guide and facilitate practice, the definitions, calculations, and reveries of Boethius are no more useful to a modern musician than Newton's 'Principia' to a dancer."

St. Gregory the Great appears to have been the first to reduce Boethius' use of fifteen Roman letters to seven, and to repeat these for the corresponding notes in the upper octaves, just as we do now; and this improvement in notation may be said to be the point of departure in that slow and gradual process by which the confused Boethian version of obsolete Greek systems was converted and developed into what we now understand by the science and art of music. We are then in

this, as in several other matters connected with music, under no small obligations to St. Gregory. I need not go into his reform of the system of the ecclesiastical modes, and the marvellous improvements he introduced into the music of the church. Every one here probably knows of his labours in these matters; nor are the so-called Gregorian tones part of my subject to-day. Let it be remembered, however, that St. Gregory lived from 542 to 604, and that his system of ecclesiastical chanting was introduced into England by St. Augustine the monk, at the beginning of the seventh century. Let it be further borne in mind that no musical notation was then in use, except the first seven letters of the Roman alphabet, and that consequently it is a proof of gross ignorance to call the four-lined stave and square-headed notes, now used for the plain-chant, Gregorian notation, it being at least 700 years later in date. Let it be also borne in mind that harmony was utterly unknown to St. Gregory, and was not admitted into the church till many hundred years after his time. Harmony, it is true, may be said to have existed after a fashion among northern nations from a more remote period; but only in their secular music, so far as we can discover. St. Isidore of Seville, in the seventh century, gives the first known definition of Harmony; he calls it "Modulatio vocis, et concordantia plurimorum sonorum, et coaptatio," but it is impossible to gather from his writings that anything which is at all analogous to our idea of harmony was practised. It was merely a speculation, a calculation, not a rule of art; nor even as such did Isidore admit any concords except the octave, the fifth, and the fourth, with their compounds.

As De Coussemaker truly says, "Ce sont là les seules notions que l'on possède sur la musique à sons simultanés antérieurement au septième siècle, et ces notions, bien succinctes, sont encore plûtot théoriques que pratiques." During the eighth and ninth centuries we do not find, nor do we expect to find, any treatises on music. Those were days when all intellectual development was at a standstill. Still it is not improbable that practically the art of music may have made some advances during that dark period, though we do not find such progress recorded. Indeed, we find rules for the practice of the *Organum* in the works of Aurelianus of Rheims, Remigius of Auxerre, Regino of Prum, and others towards the end of the ninth century, and although one cannot call the *Organum harmony*, consisting as it did solely of consecutive octaves, fourths, and fifths, yet it showed that a tendency to polyphonic singing was gaining ground. At the beginning of the tenth century we meet with Hucbald, who wrote a treatise on music called "Musica Enchiriadis," and another called "Scholia de arte Musicâ," in which he gives a definition of harmony much

more in accordance with our notions than any which had previously been propounded. "Symphonia," he says, "est vocum disparium inter se junctarum dulcis concentus." But he only admits as concords the octave, the fifth, and the fourth, with their compounds. Such combinations were then called *diaphonia* or *Organum*, or *discantus*. And such was the idea those ancient theorists had of harmony. It was merely the performance of one and the same melody simultaneously at different pitches not only in different octaves, but at the intervals of the fourth, the fifth, the eleventh, and the twelfth, than which nothing can be imagined more barbarous, and more shocking. Hucbald, however, mentions *as a new invention*, of which he gives examples, a sort of diaphony in which certain other intervals are occasionally admitted, and in which the melody in the different voice parts is not always the same. This is an important step in advance. But we now come to speak of a man who exercised a very wise influence on the art of music, and whose celebrity was European—Guido, a monk at Pomposa, who was born at Apezzo about the year 1000, and died about the year 1050. From the accounts given of him by writers of the succeeding century, one would suppose that he had well-nigh revolutionised the art of music, not only by the excellent schools of musical instruction which he undoubtedly set up, but also by several inventions, such as the systems of hexachords, the principles of solmization, and the Guidonian hand; of all which he is the reputed originator. Yet Fétis in his "Biographie des Musiciens" proves from Guido's own words that none of these inventions were his in reality, though many of them were adopted by him, and all were discoveries of his time. However that may be, there can be no doubt that his excellent mode of teaching, and the introduction of these novelties, did unquestionably do a great deal to advance the art, both as to theory and practice. Guido's known works are four, of which the most important is his "Micrologus:" then follows his Antiphonary, his letter to the monk Michael, and a small tract entitled "De sex motibus à se invicem." The best edition published of the "Micrologus" is that of Gerbertus in his "Scriptores Ecclesiastici de Musica," published in 1784. John Cotton, a writer on music in the latter half of the eleventh century, is the first to recommend *contrary motion* of the parts, between the plain chant and the organum, and here we have a great advance towards modern harmony; still the effect must have been very bad, on account of the rejection of all intervals, except the octave, fifth, and fourth, and their compounds. De Coussemaker, in his admirable work, "Histoire de l'Harmonie au Moyen Age," cites MS. treatises published subsequently to that of John Cotton, and before the end of the twelfth century, of which he gives both

the text, a translation, and an analysis. From these it appears plainly that during that century consecutive fifths gradually disappeared, contrary motion prevailed, thirds and sixths were occasionally admitted as quasi consonances, passing notes are met with for the first time, and flats and sharps introduced. Before the time of Franco of Cologne, concerning the exact date of whose works there is much difference of opinion, we have no work concerning mensurable music. But musical rhythm must have existed in secular music, and especially in dance music, from a very early period; indeed, when Miriam "took a timbrel in her hand" and accompanied the dances and songs of the Israelitish women after their deliverance from the Red Sea, her music must have been rhythmical and measured; but no such music was admitted into the church, so far as we know, before the thirteenth century. Supposing then that Franco wrote in the twelfth century, which seems most probable, his treatise on mensurable music is the earliest on that subject which has come down to us: and he is probably the first who developed from the old Lombardic notation those signs which were used to indicate the various lengths of notes and rests, such as maxims, longs, breves, and minims. The complicated system of time-notation thus introduced became thenceforward one of the most prominent features in the theoretical treatises of all writers on music, and no one can properly read, or translate into modern notation the music of the thirteenth, fourteenth, and fifteenth centuries, who has not made himself master of this cumbrous and difficult notation. But that is not all. The moment music was regarded as mensurable, counterpoint became possible: and took its rise first in what was termed discant, or the art of joining one melody to another. And this was done in two ways, either by studiously constructing this kind of discant or rude counterpoint on paper, or else by extemporising it at the time of performance. This latter kind being termed by the Italians, "Contrappunto alla mente." Thenceforward the old consecutions of fifths and fourths were speedily and finally banished, and part-music soon began to assume something of its modern form.

When measured descants were superadded to the ecclesiastical plain-song, and this last was so modified as to bear this treatment, the combination thus effected was termed falso-bordone, faux-bourdon, or faburden, and we have it still in our English Cathedral services, in the harmonised responses of Tallis and other church-composers. I need do no more than cite the names of other theorists of the thirteenth and fourteenth centuries, as however valuable their works are in tracing the gradual emergence of our art from mediæval confusion into a state of intelligible order, none of them can be said to have inaugurated a new epoch, or introduced any violent innovations

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into the system as then received. I will therefore simply name the following, most of whose works have been published either by Gerbertus or De Coussemaker: John de Garlandia; one surnamed Aristotle (whose works have been falsely attributed to Venerable Bede), Pierre Picard, John of Burgundy, Jerome of Moravia, Walter Odington (a monk of Evesham; about 1217), Philip de Vitry (1300), Marchetto of Padua, Robert de Handlo (an English writer on music of the fourteenth century), John Hothby (also an Englishman, but resident at Venice at the same period), John de Muris (a Frenchman, and a celebrated authority on musical matters, 1300 to 1360); Simon Tunsted (circ. 1350), John of Tewkesbury, and John Hanboys (three Englishmen, of whom the latter is probably the first recorded doctor of music of Oxford), Ægidius de Murino, Nicholas of Capua (circ. 1390), Vetulus of Anagnia, Theodonus of Capua (whose work is dated 1431), Prosdocimus de Beldemandis, and several anonymous writers whose works are all of interest to musical antiquarians. Any one who is curious in such matters may consult the works of De Coussemaker and Gerbertus, where these ancient MSS. are analysed and printed in modern notation. It will suffice for my purpose if I say that for the most part their treatises are founded on Boethius, Guido, and Franco, and that they copy each other very extensively.

The only other ancient writer whom I need mention is John Tinctoris, born at Nivelles in Flanders in 1445, and who died in 1511. He was a voluminous theoretical writer, and also a composer, and his works may be regarded as a link connecting the mediæval musicians with those of the fifteenth and sixteenth centuries, some of whose works I am about to bring under your notice. Tinctoris was a Fleming by birth, but an Italian by residence, as he was chaplain to Ferdinand of Arragon at Naples. He was a master of arts, a licentiate in law, and a professor of music.

Having now given you a rapid sketch of the progress of musical art, as it may be gathered from the early mediæval treatises which have come down to us, it remains for me to bring before you some of the famous Italian and Spanish musical theorists who form the main subject of this paper. The first on the list, and in some respects the most important, is Franchinus Gaffurius or, in Italian, Gaffori. This celebrated man was born at Lodi, January 14, 1451, and was of humble parentage. After studying theology and music for many years, he was ordained priest, after which he appears to have continued his musical studies for four or five years more. He followed Prospero Adorno, Doge of Genoa, first to Genoa, in 1477, and then to Naples. Here he found John Tinctoris, of whom I last spoke, and some other learned musicians, from whose intimacy he benefited much. It was at Naples that

Gaffurius published his earliest work in 1480. It is entitled, "Clarissimi et Præstantissimi Musici Franchini Gafori Laudensis theoricum opus musicæ disciplinæ." Not a very modest title, you will say, but such was the fashion of those days. The work is an abridgment of Boethius, followed by an account of the tonality of ancient Greek music, and of the Guidonian system of solmization. A second edition appeared in 1492, entitled, "Theorica Musica Franchini Gafuri Laudensis," and was printed at Milan. There are so many changes and improvements in this edition that it may be regarded as a new work. Gaffurius left Naples in 1482, and, after staying a short time at Lodi and at Bergamo, was appointed Præcentor of Milan Cathedral in 1484, which office he retained till his death, which took place in 1522. It was in 1496 that he published the first edition of his best known and most useful work, "Practica Musicæ, sive Musicæ Actionis," at Milan. Of this the second edition was published at Brescia in 1497, and the third at the same place, in 1502. The fourth edition was published at Venice in 1512. The later editions have the title, "Practica Musicæ Utriusque Cantus." This is really a practical treatise on musical composition, and although, like others of the period, it devotes much space to useless calculations of proportions and other subtilties derived from Boethius, and utterly valueless to the advancement of the art, yet it also contains many useful contrapuntal rules, illustrated by good examples; and the notation is similar to that of the present day, the plain-song being on four-line staves, with square-headed notes, while the figurate examples are on staves of five lines, at that time a somewhat novel method of writing. This work was for many years regarded as the principal text-book on music, and is largely quoted by succeeding writers, as of paramount authority. In 1508 Gaffurius published at Milan a work in Italian, called "Angelicum ac Divinum Opus Musicæ Franchini Gafuri Laudensis, regii musici, ecclesiæque Mediolanensis phonasci: maternâ linguâ scriptum." Of this work I have never seen a copy. I doubt if one ever came into this country.

In 1518, Gaffurius published at Milan a work with the following title: "Franchini Gafurii Laudensis Regii Musici publicè prohtentis; Delubrique Mediolanensis Phonasci; de Harmoniâ Musicorum Instrumentorum Opus." At the end of this work is an account of the author's life written by Pantaleo Melegula, of Lodi, from which most of the details I have given have been derived. It also appears from this notice that Gaffurius had written many tracts for the instruction of his pupils, of which only the most important were published, and that besides this he had caused translations to be made of the Greek treatises of Aristides Quintilianus, Manuel Briennius, Bacchius, and Ptolemy. The treatise, "De Harmoniâ Musi-

corum Instrumentorum," is not, as its name would seem at first sight to imply, a treatise on instrumental music, but merely a commentary on Boethius, and a description of the system of Pythagoras. It is therefore of no practical utility at the present day. In 1520 Gaffurius published at Turin his work, styled "Apologia Franchini Gafurii adversus Joannem Spatarium et complices Musicos Bononienses." Of this work I have never seen a copy, but it forms part of a great musical controversy which raged with violence for many years between our author and two clever musical writers, Aron and Spataro, concerning some questions of intervals and ratios, which seem to us trivial in the extreme, but in which Gaffurius certainly had the best of the argument, although his manner of conducting it was deficient in courtesy. Franchinus Gaffurius died at Milan June 24, 1522, aged seventy-one years.

A few words are now due to his principal adversaries:—

Peter Aron was born at Florence towards the end of the fifteenth century, probably in 1489. He was ordained priest at Rome; in 1521 we find him at Imola, as chanter of the cathedral. The following year he was appointed to a canonry at Rimini. He was also *maestro di cappella* to his patron, Sebastiano Michele, and prior of St. Mark's, at Venice, where he chiefly resided. In 1535 he entered the monastery of St. Leonard at Bergamo, and afterwards migrated to one at Padua, and lastly to another at Venice. His death must have occurred somewhere about 1560; but the date cannot be accurately ascertained. His published works are the following: 1. "I tre Libri dell' Istituzione Armonica; stampati in Bologna," 1516. Of which a Latin version was made by Flaminio, and published the same year. It was this work which originated the dispute with Gaffurius of which I spoke just now. Aron was supported in this controversy by Spataro and Vulso. 2. "Toscanello in Musica di Messer Pietro Aron, Fiorentino, Canonico in Rimini," published at Venice in 1523. Of this, other editions were brought out in 1525, 1529, 1539, and 1562. My copy is that of 1529. The last edition of 1562 was published posthumously. 3. "Trattato della Natura e Cognitione di tutti gli Tuoni di Canto Figurato," &c., Venice, 1525. 4 "Lucidario in Musica di alcune Opinioni antiche e moderne," Venice, 1545. 5, and lastly, "Compendiolo di molti Dubbi, segreti, esentenze, intorno al canto figurato," Milan. n. d. Fétis remarks that Aron's doctrines were mostly derived from the writings of Tinctoris.

The most virulent of Gaffurius's antagonists, however, was Giovanni Spataro, or Spadaro, or Spadarius, so called because he began his career as a sword-maker. He was born at Bologna about 1460, and died in 1541. He completed his musical education under Ramis de Pareja, a celebrated Spanish musician, who opened a school of instruction at Bologna in

1482. Spataro was *maestro di cappella* of San Petronio, in Bologna, from 1512 to his death in 1541. Most of his works were directed against Gaffurius. I regret that I have none of them to show you to-day.

Ramis de Pareja, Spataro's master, deserves a few words of notice, for he is one of the earliest Spanish writers on music. He was born at Baeza, in Andalusia, about the year 1440, and after successfully practising his art at Salamanca he came to Italy, and established a school of music at Bologna in 1482. In that year he published a book entitled "De Musicâ Tractatus, sive Musica practica;" Bologna, 1482. In this work he appears to have departed from the Pythagorean doctrine advocated by Boethius and all his followers, and to have recommended something very like equal temperament. For this he was severely taken to task by Burci, of Parma, and defended by his pupil Spataro, who in his turn was attacked by Gaffurius, and defended by Aron and Vulso; hence an almost endless controversy as we have seen. The date of the death of Ramis is not known.

The next author whose works I wish to introduce to you is Stefano Vanneo, an Augustinian monk, born at Recanati, near Ancona, in 1493. The date of his death is unknown. In 1531 he wrote a treatise on counterpoint, which was translated into Latin by Vincenzo Rossetti, of Verona, and published at Rome in 1533 with this curious title: "Recanetum de Musicâ aureâ à Magistro Stephano Vanneo Recinensi eremitâ augustiniano in Asculanâ Ecclesiâ chori moderatore nuper editum, et solerti studio enucleatum; Vincentio Rosseto Veronensi interprete." This is certainly a most valuable work. Clearly expressed, and free from much of what I may call the Boethian pedantry of the epoch, it explains the principles and practice of plain-song, solmization, mensurable music and notation, and counterpoint. But what seems to me the most important point, it gives rules for the sharpening of the leading note, especially in what we should now call the minor mode—a practice traditionally observed by all the best Italian choirs, and notably in that of the Sistine Chapel, but denounced by many purists as a modern corruption. That it is no modern corruption is amply proved by this rare and valuable treatise, for in his thirty-sixth and thirty-seventh chapters Vanneus gives rules and examples for this very practice, "for the benefit of youths and beginners," by the use of the sharp—plainly implying that this sharp was generally omitted in writing, but supplied by tradition, and only written down when required for the instruction of beginners. "Quod ubi factitandum sit tyronibus ac rudibus adolescentibus, signo Diesis indicari solet." I think it is hardly possible to over-estimate this proof of the existence of the germs of our modern tonality before the commencement of the sixteenth century. I have

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placed a marker in my copy at the page where this is explained, so that any one may satisfy himself as to the reality of this important fact. I believe this treatise to be one of the rarest of all—my copy formerly belonged to M. De Coussemaker—and this fact enhances its value.

Another great theorist of this period was Ludovico Fogliano. He was born at Modena towards the end of the fifteenth century, and was a good scholar and musician, and died in 1539. I have here a copy of his rare work published at Venice in 1529, and called, "Musica Theorica Ludovici Foliani Mutinensis: doctè simul ac dilucidè pertractata: in quâ quamplures de harmonicis intervallis, non priùs tentatæ, continentur speculationes." It is a learned but useless treatise on the ratios of intervals and the divisions of the monochord.

Bound up with my copy of Aron's "Dubbi," are two tracts of some importance, considering their date. Of these the former is entitled, "Introduzione facilissima e novissima di canto fermo, figurato, contrapunto semplice, ed in concerto, con regole generali per far fughe," &c., &c., Venice, 1561. This appears to be the third edition, unknown to Fétis. The two former editions were printed, the one at Rome in 1553, and the other at Venice in 1558. Of the author little is known. He is called Vincenzo Lusitano; but this latter name probably means that he was a Portuguese, for he was born at Olivença in Portugal. In 1551 he had a violent dispute in Rome with Nicola Vicentino concerning a question of ancient modes, which was referred to two arbiters, Escobedo and Dankerts, and decided in our author's favour. It is supposed that his treatise was a result of this controversy. Vicentino answered it by the publication in 1555 of his work, "L'Artica Musica ridotta all' moderna pratica," of which I regret that I cannot show you a copy. Nicola Vicentino was born in 1511; the date of his death has not been ascertained. Of the dates of the birth and death of Vincenzo Lusitano nothing is known.

The other tract bound up in this same volume is entitled, "La Illuminata di tutti i tuoni di canto fermo, con alcuni bellissimi secreti, non d'altrui più scritti, composta per il reverendo padre frate illuminato Aiguino da Bressa," Venice, 1562. The author Aiguino was born in 1520. He appears to have been originally a soldier, and afterwards a monk, for in the inscription placed round his picture, in the title-page of his work, he is styled Capitano. He was a pupil of Aron, and taught the same musical doctrines. The date of his decease is not known.

The next great musician who comes before us as a theorist is perhaps of all the Italians who have written on music the greatest. Giuseppe Zarlino was born at Chioggia, near Venice, in 1517. He became a pupil of Adrian Willaert at Venice, and was *maestro di cappella* at St. Mark's in that

city, 1565. He died in 1590. He was in holy orders, and the chapter of Chioggia, his native place, in 1583 requested the Doge of Venice to appoint him their bishop. This dignity, however, he declined. As a composer Zarlino enjoyed considerable fame. But unfortunately very few of his compositions have come down to us. It is, however, as a theorist that Zarlino's name has become a household word among all who are cognizant of such matters. His two principal works are: 1. "Istituzioni Armoniche," Venice, 1558, of which other editions appeared in 1562 and 1573. 2. "Dimostrazioni armoniche," Venice, 1571, of which a second edition appeared in 1773. Of these works the former is a most useful and practical treatise on the counterpoint of that period, though it also contains some calculations after the manner of Boethius, which are of no value to the art. The latter of these works is certainly of inferior importance, as it consists almost entirely of this kind of pedantic matter. Zarlino advocates the doctrines of Ptolemy in both his books. These doctrines having been attacked by Galilei and other Pythagorean partisans, some years later, Zarlino replied by the publication of his third work, "Sopplimenti Musicali," Venice, 1588. On the whole, it may be said that no writer did more to advance the cause of real art in his day than Zarlino.

The most violent antagonist to Zarlino's theories was Vincenzo Galilei (father of the renowned astronomer Galileo Galilei). Vincenzo Galilei was born in 1533. He was an amateur of music, and composed some music, now lost. His principal work was his "Dialogo della Musica Antica, e della Modema;" Florence, 1581—a second edition of which appeared in 1602. It is a pedantic disquisition on the musical systems of the Greeks, and the author in it opposes the views of Zarlino; and to the second edition is appended his answer to Zarlino's defence. In 1589 Galilei again attacked Zarlino in the bitterest terms, in a work entitled, "Discorso Intorno alle Opere di Messer Gioseffo Zarlino di Chioggia," and published at Florence. It must be confessed that Zarlino had the best of this controversy.

The next writer who comes before us is a learned Spaniard. Francisco Salinas was born at Burgos about the year 1512. At ten years of age he nearly lost his sight. But in spite of this he soon became an excellent musician and a good classical scholar. He graduated in philosophy at the University of Salamanca. He visited Rome, where he was ordained, and after twenty-three years' residence was recalled to Salamanca, where a professorship was awarded him in musical theory. He died at Salamanca in 1590, aged seventy-eight years. In 1577 he published at Salamanca his learned treatise, of which the title is as follows: "Francisci Salinæ Burgensis Abbatis Sancti Pancratii de Roccâ Scalegnâ in

regno Neapolitano, et in Academiâ Salmanticensi Musicæ Professoris, de musicâ libri septem," &c. In this work he first propounds the doctrines of Boethius, and then gives a very learned account of the mode of combining the rhythm of poetry with music. This latter part is the most valuable portion of his work.

The next author whom I must mention is an Italian, who wrote in Spanish. Domenico Pietro Cerone was born at Bergamo in 1566, where he studied both music and theology, and was ordained priest. In 1592 he went to Spain, where he travelled much for a year, and then entered the service of Philip II. as court chaplain, which office he also held under his successor. About 1608 he came to Naples, where he was attached to the Chapel Royal. In 1613 he published his great work, "El Melopeo y Maestro, tractado de música theórica y practica," &c., Naples, 1613. It is a folio of 1160 pages. My copy formerly belonged to Dr. Crotch, and has unfortunately lost the first title-page. It is a gigantic undertaking to read this enormous work, and I must honestly confess that I have only done so in part. Its style is sometimes both pedantic and prolix; still it contains some very excellent things, and as Fétis well remarks it is almost as though it had been written by two different men; one clear, simple, and explicit; and the other pedantic, prolix, and confused. In consequence of this peculiarity, Fétis has been led to conjecture that a great part of the work consists of an unpublished treatise by Zarlino, of which Cerone had got possession of the original MS. It appears that Zarlino for some years before his death had been collecting materials for a grand musical work to be called "Il Melopeo," but that after his death his MS. was never found. Fétis supposes it to have fallen into Cerone's hands, and to have been worked up into his book, which bears the same title. I confess this conjecture seems to bear every mark of probability. However that may be, the work is both valuable and rare. Cerone wrote it in Spanish for the benefit of his master, Philip III. The date of Cerone's death is unknown.

I shall only mention one more author, as this paper has already grown to greater dimensions than was originally intended. Lodovico Zacconi was born at Pesaro, somewhere about the year 1550. He became an Augustinian monk, and held office in the chapel choir of Archduke Charles of Austria at Vienna, in 1593. Two years later he was transferred to the chapel of the Elector of Bavaria. In 1619 he returned to Venice, where he remained until his death, the date of which is uncertain. He published the first part of his admirable work, "Pratica di Musica," at Venice, in 1592, and a second edition in 1596. The second part was brought out in 1622, and is seldom to be met with. I have never yet

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been fortunate to meet with a copy, although I have possessed the second edition of the former part for some years. Fétis says, with justice, "Cet ouvrage est un des meilleurs qui ont vu le jour en Italie, et c'est celui qui fait le mieux connaître la situation de l'art au commencement du dix-septième siècle." In this opinion I fully concur.

I must now gather up a few stray threads of my subject, and speedily bring this paper, already too long and dry, I fear, to a close. The reason I have given no specimens of works of the seventeenth century is that it was at the beginning of that time that modern tonality took its rise through the innovations introduced by Monteverde, and that the art was thus revolutionised. It seemed, therefore, best to draw the line at the close of the sixteenth century, and confine our attention to works written before the introduction of unprepared fundamental discords. These works show us what was the state of musical knowledge in the days of Palestrina, and of our own Tallis and the Elizabethan school. It sufficed for the production of some of the grandest monuments of genius which the world has seen. When we remember how the art was fenced about in those days with rigid and cramping rules of counterpoint, how much time was wasted in studying the useless lore handed down from antiquity by Boethius, how paralysing the supremacy of the ecclesiastical plain-song must have been to the originators and inventors of new melodies and harmonies in those days, it becomes a matter of wonder how such beautiful music could have been produced as flowed from the inspired pen of Palestrina and others of his school; how such smooth and soothing madrigals could have been imagined by men who lived in such times; in short, how the force of genius could have risen superior to such obstacles, and have converted them into means of securing musical wealth. All honour then be given to the giants of those early days. Let no one boast of his superiority now; for we have had all the old difficulties swept away by the resistless besom of time, and can do many things which the iron rules of inveterate tradition formerly proscribed.

In conclusion let me once more apologise for what I fear has been the tediousness of this paper, and express my hope that on some future occasion I may be allowed to take up this subject where I have now laid it down, and trace the progress of the art down to periods nearer to that in which our lot is cast.

DISCUSSION.

The CHAIRMAN said he was sure that they all felt very much obliged to Sir Frederick Ouseley for his very exhaustive paper,

and that they were, like himself, all hoping to see it in print, because it would be very valuable for reference; and he was sure they would all turn to it frequently in order to trace the gradual growth of music in parts. He thought that those who did not know it, would be glad to hear that there was a cheap reprint of Boethius in German for one shilling and sixpence, so that if any of them wanted to study his extraordinary views, any foreign bookseller would get the book for them. It was exceedingly well edited, like most German reprints. As regarded the date and work of Guido, it was not at all odd that there should be some difference of opinion as to his deserts as an inventor, because they all knew that in music, like in all other arts and sciences, it was very difficult for any individual to work hard at a subject without finding when he was nearly ready to announce what he had discovered, that a very large number of people had been working very much on the same lines and producing almost the same results. This made it very rarely possible in human history to put your finger down on a certain man, or on a certain date, and say that this was the man who discovered a certain thing. Many of them who had dabbled in reading had noticed, no doubt, that human thought had often overlapped, and some man was before his time; and in that way facts, almost of startling contradiction, would turn up. There was a gentleman in the room who, he was quite sure, would have some remarks to make about the introduction of four lines which had been put, he believed, by the learned lecturer at a much later date than that gentleman could prove it to have been. He dared say that many of them had worked at those treatises in early writers which have been so carefully edited by De Coussemaker. He supposed that very few of them had read them all the way through; but in moving from one to the other, or taking a sufficient view of them to see their drift, perhaps they had noticed how very much better the early writers would have got on if any one of them could have started fair without any literary ancestors. The dreadful way in which they thought that advance could only be made by grafting a very small amount of new thought on a very large amount of old thought was appalling; and it stood very much in the way of progress. Each man who began thought it necessary to go through exactly the old changes. A very interesting allusion, he thought, was made by the lecturer to the loss of musical rhythm in church music. As far as he (the Chairman) understood it, it seemed to be due to several causes combined. One was the divorce between music, poetry, and dancing. Of course the Greeks required no system of notation for rhythm in music, because when they sang lyric poetry the rhythm of the poetry, as he understood it, was the rhythm of the music. They could not be separated. The same applied, of course, to dancing,

because when they danced and sang words at the same time, in that case there were the whole three combinations. But when music had to be revived by the primitive Christians two of the features disappeared. They lost the rhythm of the poetry, and they lost their dancing. He supposed that he should be justified in saying that probably the earliest attempts to set music to words were made with regard to prose words—to Holy Scripture probably. Words, however rhythmical in their original language, were translated into prose for the use of the period. In that way music really had to start without a chance of definite rhythm, and it was a curious thing, which he dared say everybody there had very much lamented, that to this day they had not really a notation of rhythm. The only approach that was made to it was by some authors who used a slur to tell them how to phrase, but that was only a small element of the whole question of rhythm. If members of the Musical Association wished to immortalise themselves, they had better devise some rhythmic notation which could run over the top of the pages of their best classical works. He dared say that if they did so, many hundred years hence they would have their treatises brought on to that table, and be praised by some future Oxford professor. There was one portion of the history of music which, he thought, they should have to say was lost and never could be recovered, and that was the portion which was growing collaterally with, but perfectly independently of, the writers. They got those treatises which were very often written, he supposed it was fair to say, by men who very seldom heard any music at all. They were more theoretical than practical. On the other hand it was perfectly well known that there was a sort of music existing the whole time, certainly national songs, and certainly, he dared say, large numbers of national dances. If ever that portion of the history of music should be recovered it would be an enormous boon, because that history should run parallel with the same exhaustive and learned sketch which they had heard; but where it was to come from he could not tell. He was speaking of the time prior to the settlement of the present European basis of nations. It was not fair, he thought, to assume that music ceased to exist in troublous times. It was very curious to observe sometimes how times of national trouble seemed to make some minds rather more inclined to be contemplative and thoughtful with regard to art.

Mr. CHAPPELL said that the large amount of information concentrated in the paper just read by the President made it admirable, and the members had good reason to return thanks for it. As he had been referred to by Dr. Stainer he would offer a few additional comments; and first upon the early use of sharps and flats. Their employment in printed books at an early date had been exemplified in the very rare volume which

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the President had shown to them, and he would add that they are also to be found in manuscripts long before the invention of printing. In mediæval Latin all notes which were not included in the ecclesiastical scale—all sharps and flats—were termed *synementa*. The name was derived from the Greek tetrachord *synēmmenōn*, the one which included B flat in the Greek conjunct or connected system of tetrachords. In the common Greek scale its notes were A (the Mese or Greek note), B flat, C, and D; whereas in the disjunct system the tetrachord would begin on B natural and run up B, C, D, E, as in the lower octave. This should be noted, because it accounts for there being both a B flat and a B natural in the second octave of Guido's scale, and in all scales upon the hexachord system, but no B flat in the lowest octave. A chapter, "De Sinemenis," explaining how to bring into use all the sharps and flats will be found in a manuscript in the British Museum (Royal MSS. 12, c. vi). Its date has been decided by the skilled authorities to be about the middle of the thirteenth century. The treatise is "De Mensuris et Discantu," and the chapter "De Sinemenis" is the last. As the writing abounds in contractions, some may find it easier to read the transcript made in the last century for Sir John Hawkins, which is also in the British Museum (Additional MSS. No. 4,909, folio 185). "I might add," said Mr. Chappell, "that it has been printed by M. De Coussemaker (*Scriptores* vi., pp. 364-5), but, unfortunately, very incorrectly, owing to the proof-sheets not having been sent to England for collation. In no case within my knowledge did M. De Coussemaker use that necessary precaution, and such disregard of accuracy detracts greatly from the value of M. De Coussemaker's publications. He was content to trust to his printer, and the French printer had a difficulty with English writing—especially with capital letters. It is necessary that I should explain this, because I collated every transcript before I sent it to him, and this cost me a large amount of time." In these early ages music in which sharps and flats were used was commonly called false or feigned (*falsa* or *ficta*), because it differed from the ecclesiastical scale; but, says the writer of the above-named manuscript, "no music is naturally false." This writer, if not an Englishman, had at least been long in England. He refers to several of the best English singers by their names. Jerome, of Moravia, is another writer of this thirteenth century who refers to the employment of sharps and flats in church music, but he limits their use to descant. His words are, "Licet autem in discantibus synemenia sunt utilia, tamen cantus ecclesiasticus ipsum non recipit ullo modo." (De Coussemaker, *Scriptores*, i., 86.) Upon the subject of "Musical Notation" Mr. Chappell would

simply draw attention to a system peculiar to England before notes of time were invented. The neumes were written upon four lines and the intermediate spaces, any note of the scale being at the signature, instead of only F, C, or G. This notation was used for new Anglo-Latin hymns, while the ancient and well-known parts of the service were noted in neumes without lines and spaces. Examples will be found in the Winchester Book, included in the Bodleian Library, Oxford (MSS. Bodley, No. 775), in the "St. Albans Gradual" in the British Museum (MSS. Reg. 2, B. 4), and in a MS. in the Cotton Collection (Caligula A, 14). The first of these three MSS. is shown to have been written in the eleventh century by the prayer for the king and people, in the third litany: "Pro Rege Ethelredo et exercitu Anglorum te rogamus." Ethelred II. died in 1016. Guido d'Arezzo knew nothing of the lines and spaces which tradition has assigned to him. His acquaintance with musical notation extended no further than the use of a red line for F, and a saffron (crocus) line for C.

The Rev. Thomas Helmore said that Sir Frederick Ouseley had given them a very great treat in his view of those books. With regard to rhythm, his (the speaker's) view was not quite identical with that either of the lecturer or of the chairman. He could not help thinking that the melodies of the Hebrew language would have somewhat, at all events, tended to guide and direct the rhythm of the music; and as in the history of the Christian church, music undoubtedly came from the east, and was probably handed down traditionally from those who were familiar with the Hebrew music, therefore whatever they had with regard to the strains which were then sung and handed down to them through tradition, they would also have, to a certain extent at least, the rhythm which had been first imposed upon them by the words. In handing these melodies over to other languages, a similar rule would, probably, apply. He was speaking simply *primâ facie* from analogy. They should suppose that the same melodies would be, *mutatis mutandis*, set to words that would suit them, and therefore the rhythm of the melodies would be, to a certain extent, retained. When they came to ask whether there was such a thing as metrical song, he thought that if they looked at the history of music, and if they looked particularly with regard to what was said of the Hebrew sects who sang, the expressions used in recording their music implied that they had verse music in our sense of it; that is to say, that they had lyric music as well as prose. The three divisions of Christian music into psalms, hymns, and spiritual songs might probably help them, to a certain extent, to judge that there would have been a variety of rhythms introduced, which rhythms would be analogous to the

rhythm of words. He would also say that he thought there was as much rhythm of its own kind in prose as there was in verse, and that the orators of old, for instance Cicero, would have spoken with a rhythm; and therefore words did convey a rhythm of their own independently of music.

Sir Frederick Ouseley wished to make one observation in reply. He thought that a broad distinction ought to be drawn between poetical rhythm or prose rhythm, if they liked, and musical measure or rhythm in the sense in which they usually understood it, which was more likely to be derived from dancing originally, he thought, than anything else. The regular recurrence of beats, almost like the ticking of a pendulum, was, he thought, very distinct from the looser kind of accent and rhythm which would come from poetry or from any other cause, as to which he had nothing to say against what the last speaker had just observed. Bearing that in mind, he thought that both propositions might properly stand true.

Mr. Chappell said that there was one word about Hebrew music which perhaps should be added. The musical system of the Jews was the same as that of Assyria, of Egypt, and of Greece. In the collection of coins in the British Museum, they would see one of Judas Maccabæus with a Greek lyre upon it; as to rhythm, the ancient Egyptians beat time with their hands, and the Greeks with their feet.

Dr. Bridge said that he should like, with the permission of the chairman, to ask Sir Frederick a question on that point to which he alluded, which was one at any rate in which he (Dr. Bridge) took considerable interest, and that was as to the system laid down by the author—he did not quite catch the name—before the commencement of the sixteenth century as to the raising of the leading note. It was not absolutely marked as he understood it, but it was understood, and Sir Frederick said that the rule was laid down particularly for the guidance of youths. Did those rules apply to such writers of English church music as Bevin and Hilton, and Tallis? Would the practice apply to their music?

Sir Frederick Ouseley: More generally speaking, I should think you would find the accidentals marked.

Dr. Bridge said that he wished that he did find them marked. That was precisely the reason he asked. He must confess that sometimes it was his duty—he would not say privilege—to play compositions, if they might be termed so, of a certain period, in which it would really add very much to the pleasure if he could possibly raise not only the leading note but some of the other notes. Some of the crudities were almost too much for one, and he had thought that there might be an explanation, and that it could not be intended to stand as marked. He did not mean to say that he wanted to make

every old composition sound like a modern composition. There must be, to a certain extent, an old feeling about it, but he thought that if such rules could be definitely put out with such authority as they appeared to have that day in Sir Frederick, they might be warranted—he should be warranted—in altering the copies ("No, no,")—making them more like music and less like—he hardly knew what to call it. But, at any rate, he should be very much pleased if he could get some definite data which would guide one when one had a knotty point presenting itself.

Sir FREDERICK OUSELEY said that he had no answer to make to Dr Bridge's questions, except that it seemed to be a matter of tradition and a question of what had been the tradition in such music as Dr. Bridge was alluding to. He (Sir Frederick) should doubt there being any one tradition in English music, but among the Italian music that he alluded to there certainly was an almost universal tradition of sharpening those notes according to a rule given in the book of Vanneus, and therefore the cases were not similar. If Dr. Bridge could adduce any English tradition as to sharpening leading notes and flattening the sevenths or anything he liked which modern ears required, well and good, but if he could not produce such a tradition, he should not meddle with the old.

Dr. BRIDGE: Had foreign music and foreign theories nothing to do with English music and theories at the same time? Did they know nothing about them?

Sir FREDERICK OUSELEY replied that his answer to that was, read Morley's book.

Dr. BRIDGE said that still one would be very glad to know whether the rules for raising the leading note at precisely the same period abroad did not apply to English music. Of course he stood open to correction, but he could hardly believe that such a theoretical point as that obtained in foreign music did not obtain in English music He wished to know whether it applied to Bevin and Hilton, and people of that time?

Mr. CHAPPELL said that the manuscript of the thirteenth century of which he had spoken was either English or of one well acquainted with England; therefore English musicians perfectly well knew it.

Dr. BRIDGE said that that bore out the opinion that the English did know of that system.

Mr. CUMMINGS said that it appeared to him that they were getting rather into a muddle. Dr. Bridge spoke of Bevin as if he lived in the thirteenth century.

Dr. BRIDGE: No, no.

Mr. CUMMINGS: Neither Bevin nor any of the English church-music writers date back earlier than the time of Charles II., and their music was perfectly plain.

Sir FREDERICK OUSELEY: James I. and Elizabeth.

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Mr. CUMMINGS said that none of them were very far back, and as he admired modern music, he should be exceedingly sorry to see Dr. Bridge put a sharp or a flat into Bevin or any other ugly composer; and if such a thing was done to make the music palatable to modern ears, it would be a very wrong thing. They all knew that "John Anderson, my Jo," has had in modern times a sharp seventh inserted at the end that was quite incorrect, and to his ears the flat seventh was very much more agreeable.

Mr. CHAPPELL: But the flat seventh to "John Anderson, my Jo," is devoid of authority. The tune is an English country dance and harvest song. He could not agree that it was desirable or even tolerable to reject the major seventh or leading note in favour of the minor seventh, which had no harmonic relation with any scale.

Mr. CUMMINGS said that as to the tune of "Wandering Willie," he certainly very much preferred the first part, that was the older part of the tune with the C natural. He thought that the flat seventh, D, E, F, G, A, C natural, D, was perfectly lovely; and clearly many of the old authorities, as Bevin and others, intended to write in that D minor mode of the flat seventh, and Dr. Bull clearly intended to write in what were called the Greek modes; therefore to introduce the accidental sharps and flats he should consider not an improvement, but a barbarism. If the old church music was ugly, let it remain ugly still. Many people might think that the monolith on the banks of the Thames was very ugly, and that they could improve it, but he thought that it would be much better to let it alone. Therefore he hoped that those who thought that the old church services were very ugly would let them alone, and not bring them to the taste of modern days. Times might come round when they would cease to be considered ugly. As to modern music, he hoped that nothing of the kind would be attempted in that respect. It seemed to him that the fact which Sir Frederick had pointed out to them did not apply to modern services.

In answer to Dr. Bridge, Sir FREDERICK OUSELEY said that the period of Bevin's death was 1622.

Mr. CHAPPELL said that Sir Frederick had in his library a very elaborate work which showed that the system of employing sharps and flats in the so-called Gregorian music had been maintained down to the last century. He had read it with great interest, and had transcribed many of its pages. It was not long ago that Mr. Hopkins delivered a lecture in which he proposed composing in these very old modes, and confining the harmonies to a mode in which no inflection of sharp or flat would exist. He must say that he hoped that Dr. Bridge's proposed improvement would not take place.

Mr. OSBORNE said that they had heard from learned doctors a

great deal about sharps and flats and modernising church music by sharps and flats. At the same time he should be very sorry to see the sharps and flats introduced, because, if they set about modernising, what would become of their own national music? If they went back to their old national airs and their Irish airs, he should be very sorry to see the sharps and flats introduced; and certainly as an Irishman he should not recognise them.

Dr. Pole could cordially support the remarks which had fallen from Mr. Cummings. The subject of tonality generally, involving the differences between the modern and ancient modes, was attracting much attention just now. It was professed that we had, in modern music, two modes founded on the diatonic scale, the major and the minor; but this was hardly correct, inasmuch as the minor mode, by the sharpening of the seventh (and sometimes the sixth also) in ascending, was deprived of its original character and became assimilated to the major—in fact, in that form it ceased to be a diatonic scale at all; the true diatonic arrangement of tones and semitones being departed from. Hence we had really only one true diatonic mode, the major; the other being partially chromatic. The restoration of the minor mode to its original form, by keeping the seventh always minor, appeared not only to have precedents in early times, but had been attempted in modern days. Dr. Stainer had already mentioned an example, and the opinion quoted from Mr. Hopkins was entitled to much weight. To come to lighter music, reference might be made to a song now very popular, "The Clang of the Wooden Shoon," where (probably in imitation of the old Irish tunes) the cadence in the minor key was used with the minor seventh, and people seemed to take to the change very willingly. But the same thing had been done in a more authoritative manner. M. Ducoudray, the Professor of Musical History at the Paris Conservatoire, had been lately exciting much interest among musical people by lecturing on the subject of the modes, and advocating extended principles of practice, which he had illustrated to a large extent by his own musical publications, having also used frequently the cadence with the minor third on the dominant. The late Moritz Hauptmann also, of Leipzig, who was esteemed one of the first theorists and teachers of Europe, had remarked that modern music was confined in a very narrow circle by its being limited to our present modes, and that the time would come when composers would make a feature of enlarging their resources in this way. But this could never take place while musicians were obstinately wedded to the idea that the sharp seventh was the only proper thing, thus mistaking for a natural necessity what was merely an impression derived from habit and custom. The Association must be much obliged to Sir

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Frederick Ouseley for bringing forward these historical matters. He (Dr. Pole) had a strong opinion that history was very important, not merely as a matter of curiosity, but in illustration of musical theory. It was impossible clearly to understand what the established forms of musical structure meant unless we knew how they had grown up: he believed that history was as much a key to the true philosophy of music as acoustics, and that both ought to be studied together, as such a mode of study would assuredly clear away many of the fallacies by which musical theory was at present encumbered.

Mr. STEPHENS asked whether Dr. Pole meant that the cadence in a minor key was actually effected by the dominant chord with a minor third?

The CHAIRMAN: Certainly, and it is very fine.

Dr. BRIDGE said that the question was whether it could be called a perfect cadence. He had not the slightest idea when he ventured to open his mouth—as he very seldom did—that he should have drawn down on his devoted head such a tremendous avalanche. If it had not been for Mr. Chappell he did not know what he should have done. Mr. Chappell gave him a crumb of comfort. He always seemed to floor everybody else with the observation that he knew a book a hundred years before which said the very same thing. He (Dr. Bridge) could only say that he should stick to Mr. Chappell for the rest of his natural life. Mr. Cummings knew that he (Dr. Bridge) was not wanting in knowledge of cathedral music, and he ventured to think that the Association would believe he was not wanting in the respect that was due to cathedral writers. He should be the last person in the world to tamper with them. He might have had many opportunities of doing so, but he had not availed himself of them. But the point he raised was fairly founded on what Sir Frederick Ouseley had said. He had stated that it was done in contemporary music abroad, and he (Dr. Bridge) had thought that the same thing might apply to music written in England at somewhere about the same period. He had asked that question, whereupon he had been immediately flown at by all the members, and frightened out of his wits. He was glad that he had been able to elicit some little information on the subject. He did not know that Sir Frederick had quite made clear yet whether the practice did or did not apply to music written in England about the same time. He (Dr. Bridge) certainly failed to see that it was not possible. Music was a universal language, and the rules which applied in France ought to apply in England.

Sir FREDERICK OUSELEY in reply said that he did not know whether his appeal was heard, but he casually threw out just now an opinion that the real solution of the matter with regard to English music was to be obtained by studying

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Morley's "Introduction to the Skill of Music." There they would find several very curious things. In the first place, they would find rules for the different ways of writing in different modes, but, amongst other things, they would find on page 96 of the first edition an example of the clashing of F sharp against F natural, in writings of Osbert Paraley; the name of Parsley did not occur in the index of authors, but it occurred in the body of the work; and Morley said it was a kind of writing he did not like; and therefore he was in advance of his compeers, certainly, because those dreadful clashings of F naturals and F sharps, and C naturals and C sharps, were then common to all writers. They would be found in Tallis and all others. In the "Nunc dimittis" of Tallis in D, and his anthem "I call and cry," it occurred twice. But the point which he (Sir Frederick) wished to bring before them was the question of why that sharp was put in against the F natural, in defiance of one's ears. It produced the most horrible results, as he thought. It was a leading note, and it was a sharpening of the leading note which was put in at that time in defiance of the ear. Much more would it be so when the ear was not accustomed to it. When it was not thought necessary they did not write it; therefore he would say, let the old writers alone. He was only speaking of English music, and quoting from Morley.

Mr. STEPHENS said that it existed in Byrd, as in his "Cantiones Sacræ." There were several specimens of the major and minor third at the same time. But nothing could reconcile him (Mr. Stephens) to it.

Mr. COLERIDGE asked whether in any of the learned treatises which Sir Frederick Ouseley had shown them, and which were lying on the table, there was any allusion to the old headings of the old Hebrew psalms. If he remembered rightly, there were such expressions as "To the tune of the Early Dawn," "To my Dove," and "Song of Degrees" and other things of that sort, with which some of the psalms are headed. He should like to know whether Sir Frederick could give them any satisfactory information.

Sir FREDERICK OUSELEY said that he did not think in those books there was any information on the subject. As he had said just now, there was one of them which he had not read through. He had read every word of the others.

The CHAIRMAN said that he could understand Mr. Helmore's idea about the rhythmic music in the primitive Christian church. His position was perfectly tenable, supposing the melodies came bodily by tradition; and on that question the idea depended. If the Hebrew melodies did not come to the early Christians, they began without rhythm. He believed that Mr. Helmore was right in thinking that the primitive church started with some traditional Hebrew melodies which

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they had received in some way or other. He thought it would be rather difficult to show how. If they had the traditional Hebrew music, they had their music and rhythm to begin with. If they had not the traditional Hebrew music, they began without rhythm.

Mr. CHAPPELL said that rhythm was admittedly the parent of melody. First came the beating of time, and within its bounds arose melody.

Mr. HELMORE: And the words.

The CHAIRMAN said that he was rather surprised that nobody had remarked about the great difficulty of settling the "sharp" question in our madrigal literature. Perhaps if Dr. Bridge had pushed the large volumes of madrigals down the throats of the speakers, he would not have been so severely attacked. He (the Chairman) had found cases in which one distinctly wanted to put a sharp in to make the passage sound right; but he immediately found that by so doing he should upset another part which was equally unfortunate. Perhaps they put a sharp in to make one part right, and by so doing would produce a most frightful cacophony, and if they left it out, then they got a scale without a leading note. If any of them chose to compose in the old mode, they would be very much hurt if a man next week put in sharps for them. If they took up a service in the Doric mode or the hypo-Dorian mode, they would find that the man intended to write in that mode. With reference to what Dr. Bridge said about having seen a cadence written in the minor mode, he (the Chairman) could assure the meeting that he had at St. Paul's tried it with a congregation of three or four thousand singing an old Advent melody in E minor—one of the most melodious of the period—Veni Emmanuel. The cadence was B natural and E natural. He played deliberately in a chord of B minor and the common chord of E with E natural at the top, and he could undertake to say that it was very fine. Dr. Pole was perfectly right, and he (the Chairman) hoped that it would be found possible for them to be so far eclectic as to find out what beautiful music might be written in the old modes.

A vote of thanks was passed to the reader of the paper.

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April 7, 1879.

R. H. M. BOSANQUET, Esq., M.A., in the Chair.

THE CONSTRUCTION OF BUILDINGS CONSIDERED WITH REFERENCE TO SOUND.

By Cecil G. Saunders, Esq.

The difficulties which beset architects in meeting the requirements demanded of them, have always had a tendency to increase rather than diminish with the growth of civilisation.

A strong building, which should be impregnable to the attacks of an enemy, or a durable building which should serve as a monument to the owner's greatness, was once all that was required. Soon, however, the æsthetic feeling began to assert itself, and the beauty of design took an equal, if not a superior, place to the strength and solidity of the structure. After that the additional conveniences of light and air had to be considered; buildings were wanted possessing all the durability, space, and magnificence or beauty as the case might be, and at the same time care had to be taken that the health and comfort of those using them were preserved. And now, in regard to a large section of edifices, comprising churches, chapels, lecture-rooms, concert-halls, theatres, and the like, the necessity has arisen for providing hearing accommodation of the best character, to the largest number, and, of course, at the least cost.

I do not mean that this subject has only of late attracted the attention of those engaged in building, for we know from archæological researches at least some of the means that were adopted by ancient nations; but with the growing appreciation of and desire to hear good music has come, in a great measure, the modern importance of the subject which I wish to introduce to you to-night.

I cannot attempt to place before you an exhaustive paper which shall treat *in extenso* of all points of this most interesting and varied topic, nor can I pretend that what I have to say is to any great extent original or the product of my individual discovery. Neither can I hope to be able to give

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any series of rules, the application of which will in every case lead to sure and perfect success. Indeed, my esteemed friend Mr. T. Roger Smith (to whose work upon the acoustics of public buildings I am much indebted) says, and I seem to see a certain amount of quiet humour in the passage: "In all branches of architectural practice, but in none so much as in that branch now under consideration, rules and principles never did, never will, and never can supersede the necessity for intelligence, judgment, tact, experience, and something of intuitive perception in their application. The most successful architects will tell you that their judgment of the probable acoustic effect of this or that arrangement is as much or more the result of a sort of instinct, a kind of internal perception of what will do or what will not do, as it is of the application of a code of laws or a set of rules."

After a sentence such as this, from the pen of one who holds the well-merited position of a high authority upon the subject, you will readily understand the timidity with which I shall approach anything like a complete reduction of ascertained facts to rules for guidance, but at the same time I am not without hope that I may bring some facts before you in such a way as to make them of practical use and service, and I am quite sure that during the discussion to which I am looking forward I shall gain from you many valuable suggestions and observations.

It will not be necessary, nor would it be becoming in me, to take up your time with remarks upon the laws of sound: they are as familiar to you or more so than to me.

Nor, I think, need we dwell upon that part of the subject before us which refers to buildings adapted specially to public speaking. We will rather, if you please, confine ourselves to the consideration of the means to be taken for enabling large numbers of persons at once to hear vocal and instrumental music to the best advantage.

The construction of buildings of this class may be considered under six primary heads or divisions, which, however, can scarcely be treated of entirely separately, inasmuch as they are very intimately associated.

They are—size, shape, proportion, situation of the singer or orchestra, materials employed, and the bearing of all these upon the kind of music to be performed.

But, before passing to the consideration of these seriatim, let us observe the necessity of keeping the last in mind during the whole of our investigations. It is obvious, for instance, that a concert-hall might be built in the best possible way, but of such large dimensions that parts of a pianoforte solo would be inaudible to some of the listeners; or, on the other hand, we might fill a room so full (so to speak) of sound as to destroy all pleasure which the audience might have experienced

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from less. And then again there is a great charm (I will not say it is not in some measure due to association of ideas) in the long-continued reverberation to be heard in Westminster Abbey and other buildings of somewhat similar construction, but you will agree with me that it is sadly detrimental to rapid and contrapuntal music. For our purpose, perhaps, it will only be necessary to divide music (in a very unprofessional way) into the slow, the rapid, the loud, and the soft; and I think I shall be right in saying that, taking extreme cases, it is difficult to find a building equally well adapted for the hearing, by a large number, of both slow music and rapid, or, at all events, of both loud and soft. We shall have occasion to return perhaps more than once to this part of the subject, but particularly when we come to speak of the advantages and disadvantages of echo in a building. I remember hearing Mr. James Coward play a fugue on the festival organ at the Crystal Palace, during part of which the echo of one note returned to me at the same instant that I received the next note direct, and, as you may imagine, the effect was anything but agreeable. Now, on this occasion the sound was re-echoed from a large flat surface of glass, which is one of the most elastic substances known, which property, together with its smooth surface, renders it peculiarly apt for the return of echo. Supposing the listener to be between the instrument and a wall of glass when the scale passage for the violins in the "Thanks be to God" chorus from the "Elijah" is being played; if the wall is about sixty-three feet behind him and gives a perfect echo, each note in the passage will exactly meet the echo of the preceding one.

It will be obvious that the *size* of a concert-room depends more upon the amount of disposable funds than anything else, and equally obvious that a small room will not be so liable to acoustical defects as a large one. But as the question of cost and profit on cost ought to be looked at fairly, it may be well to remember that every listener must have from five to six square feet in area, and, as music should be good, and good music should be heard in comfort, six square feet is not at all too much to give to each seat, *i.e.*, including passages between one part and another. This will give an area of 6,000 square feet for 1,000 auditors, or 30,000 square feet for 5,000, which, I think, is almost the greatest number that can reasonably be expected to hear good music well.

While size depends so much upon the base considerations of money, the shape of a concert-hall is too frequently subservient to that of the plot of ground on which it is to be placed; and here it is that the architect has to make use of all his ingenuity and the utmost fertility of his resources in order to obtain the largest amount of accommodation upon the site at his disposal. But if the fates are not too unpropitious, the

usual shape for a concert-hall is a rather long rectangle; if for a large audience, galleries are introduced at the end and perhaps at the sides, the orchestra being placed opposite to the end gallery. Now, this form, although for a moderate-sized concert-room it has its advantages, for a large hall has serious drawbacks. If it be very long (and it must be either very long or very broad, or both), a large number of the audience are at so great a distance from the performers that the waves of sound—interrupted as they are by heads and bonnets—do not reach the more distant listeners with anything like their initial crispness and force. If, on the other hand, the room is very broad there is a tendency to echo, as the sound which travels direct to the listener from the orchestra comes to him also from the side-walls by a more circuitous route, giving, if not an obvious echo, an undefinedness and want of decision throughout. This, of course, would not be the same in all parts of the hall. The height of the room has also to be considered, bearing as it does directly upon its acoustical properties. And the height can only be satisfactorily considered in reference to the contour of the ceiling—what is called a waggon-headed ceiling, *i.e.*, one formed upon a segment of a circle, might be most distressing to the singer, as if he be placed in the centre from which the circle is described, he will receive an echo of great force which will probably be sufficient to prevent his exercising his power to the extent to which he would otherwise have made use of it. I am myself in the habit of speaking in a room which is about thirty-eight feet square on plan, and very lofty, with a sloping ceiling, being boarded to the rafters. As the desk is at one end and under the ridge, there are four distinct surfaces from which the speaker has his voice returned to him, viz., the two side-walls and the two slopes of ceiling boarding. These four plane surfaces seem constantly to din into his ears every word which he utters, and at such an interval of time as to make continued speech a most wearisome labour. This effect, however, is only experienced when the room is comparatively empty; when full I have not noticed it, and, in fact, with a large audience it is pleasant to sing in, and I think especially in the key of D major.

As far as I have been able to judge, a circular room has great disadvantages, particularly when associated with a high and vaulted ceiling. I find that in the chapter-house at Westminster—which is an octagon with sides of about twenty-four feet and a groined roof—the echo when the room is empty repeats itself so perfectly and quickly that it becomes a prolonged reverberation, and so much so that, by singing in moderately quick succession three or even four notes in concord, the whole chord resounds for a considerable time. In experimenting in this way in the chapter-house, in order

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to be sure that I was not listening simply to harmonics, I sang two notes forming a slightly flat major third, and after about a second the whole building seemed filled with the *beats* consequent upon the want of concord between the two notes. This tendency to echo and reverberation was only felt to a small extent during the reading of the Hibbert lectures, by Professor Max Müller, but then the chapter-house was quite full, and hangings were employed largely to cover those surfaces from which sound would be most reverberated. But even then there was at times considerable indistinctness of sound, no doubt due to a partial echo, almost, but not quite, destroyed by the hangings, and by the clothes, &c., of the audience. One of the most successful places for hearing that I know of, which approaches to a circular shape, is Surrey Chapel in the Blackfriars Road. This has sixteen equal sides, and a gallery all round, and I believe was built to accommodate 1,400 persons; it has held however nearly 2,000. It has windows all round it both above and below the gallery; the roof over the centre portion is hemispherical, with a small lantern at the apex. This chapel is almost free from echo, but it requires a powerful voice to fill it.

Great height in a concert-room appears to be disadvantageous to the hearers, excepting that a singer feels in a lofty room at such an advantage as to sing better, or at all events with more comfort, than in a low one.

I would suggest that, having due regard to proper and perfect ventilation, a concert-room should not be higher than is necessary. And, although there are remarkably good concert-halls with semicircular ceilings, yet, as a rule, this form does not appear to be so successful as a flat ceiling.

You will have observed that I have considered size and shape rather in association the one with the other, and indeed it is difficult to do otherwise if a practical result be aimed at.

Writing upon concert-rooms, Mr. H. Heathcote Statham says, "As a general rule, music cannot be really enjoyed in rooms above a certain limit of size, certainly not music requiring delicacy of execution and expression. It may be doubted whether it is possible to enable more than 2,000 persons, at the outside, to hear an orchestral symphony with full enjoyment and realisation of the intended effect."

With all due respect to Mr. Statham, I feel very much inclined to combat his suggestion, and to say that I have little doubt but that 5,000 people might, in a properly constructed building, hear an orchestral symphony with full enjoyment and appreciation of the most delicate points.

And I feel sure that you will see with me the advantages resulting from the use of large concert-halls over that of smaller ones. To take the lowest ground even, is it not a

fact that, of all the fine arts, music is one of the least remunerative as a vocation; but if twice the present number of auditors were able to listen at once, a greater profit would accrue to lessees and managers, and, by the law of supply and demand, both composer and performer would reap, at all events, part of the benefit.

And to put the matter upon wider and more Christian grounds, the humanising influence of music would be experienced by more individuals in direct proportion to the opportunities given them of hearing it.

In considering the size of concert-rooms, the first question that arises is, "How far the sound designed to be heard will travel?" Taking the ordinary voice in reading as a datum, we find (I am quoting from Mr. Roger Smith) when a person was made to read from a book on a still day on an open plain, he could be heard ninety-two feet in front, seventy-five feet on each side, and thirty-one feet behind. Now, we all know how the voice appears to get lost in the open air, in comparison with its retention indoors, and the reason is very obvious: the vibrations spreading with equal power in all directions through the air, the listener only hears the sound as it comes direct from the speaker, or perhaps slightly assisted by reverberation from the ground. By far the greater portion of sound, so to speak, goes upwards into the air, and but a small part is directed towards the hearing level. If we imagine the speaker to stand under a rather flattened hemisphere of 150 feet diameter, with his back thirty-one feet from one side of it, we shall have a pretty correct idea of the limits reached by his audible voice, and we see at once how much of his voice would be expended uselessly in the upper parts of the hemisphere. The area of ground covered by our imaginary hemisphere would seat about 1,000 persons, and supposing the speaker to be slightly raised, or, better still, supposing each receding tier of seats to be raised by increasing gradations, all would hear the reader. Musical tones, whether in singing or playing, would be heard further than the voice in reading, but how much further I am unable here to state accurately.

Beyond and outside of the hemisphere is a zone in which the sound of the speaker's voice is audible but not distinguishable, and this zone spreads outwards indefinitely to regions where the voice is unheard and its sound practically ceases to exist.

Now, a resonant wall or sound-reflector placed anywhere within the limits of the voice will have the effect of reinforcing the sound between it and the speaker, or beyond him, to some extent; and the question that arises as to the proper position of these reflecting surfaces is what we have now to consider.

But before going further in this direction I must mention an extraordinary modifying influence upon the intensity of sound

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which is produced by light. This is a fact which I confess myself unable to account for or to explain; but it is nevertheless a fact, kindly pointed out to me by your vice-president, Mr. Chappell, that sound goes towards the light Perhaps when the dynamic force of light is better understood than at present—when, for example, we know why Crookes' radiometer turns—we shall be able to obtain a scientific reason for the remarkable fact that I have just stated. Earlier in this paper I mentioned Surrey Chapel as a successful circular building, and I have no doubt that its success is in a great measure due to the many large windows with which it is lighted all round.

The position of the first sound-reflector which occurs to us, bearing in mind the hemisphere of distinguishable sound and the necessity for utilising it to the best advantage, is the horizontal one, a ceiling, in fact, which shall beat down at different angles, towards the more distant hearers, the sounds to be heard, instead of allowing them to escape into space. The height at which a ceiling should be placed depends upon the necessity for ventilation and other matters, but, as far as acoustics are concerned, I would say a ceiling should be as low as practicable, if the aim be to carry sound far in a horizontal direction. Every foot of additional height lessens the horizontal distance to which the sound can be carried, and consequently the number of possible hearers. It should, however, be remembered that the proportions between the length, breadth, and height of a room have some influence upon its musical advantages, but here we are confronted by a mass of the most contradictory evidence. The proportions of two, three, four, or three, four, five, or others as simple, are quoted as being the best for a room; but I am strongly tempted to think that in a very large hall the proportions are of comparative unimportance; and indeed there are very good concert rooms whose proportions are anything but simple, and occasionally of two rooms of exactly the same dimensions one is successful, and the other the reverse. A friend of mine was some years ago the architect of a concert-hall in a provincial town, which answered its purpose so completely as to satisfy him that he had found out all about the subject, and to induce him to write a pamphlet upon it. He subsequently erected a hall in another town of the same size—in fact, the sections were used for it that were prepared for the first; and this second hall was a perfect failure. This is one of the many unfortunate instances of the truth of the suggestion which I have previously quoted from Mr. Roger Smith. It is possible to fail in our endeavours to produce a good concert-room even when theory and practice appear to coincide towards its perfection.

The position of the performers on the orchestra is one which ought to engage our attention for some moments, as, although little regard is bestowed upon it usually, a great deal of the

possible successfulness of a concert-hall is attributable to it. As I have said before, the general arrangement is for the orchestra to be at the end of an elongated rectangular room; and for rooms of small or moderate size this would appear to be very satisfactory; but for a large hall, and I hope you are still having in view the possibility of an audience of 5,000, an orchestra or other arrangements for the performers at the end of a long room, or midway along the side of a broad one, as I have said before, must be attended with disadvantages. A circular room produces usually so much reverberation as to be useless for the purpose, although it has the advantage of giving the greatest nearness, if not the greatest happiness to the greatest number. Let us therefore fall back upon a square room with rounded corners, and, in defiance of preconceived notions of symmetry, let us put the orchestra in one corner. We will suppose the orchestra to be capable of seating 700 performers, and, by way of parenthesis, should you ask me why I fix upon that number, it is simply because I have heard very good work done by an orchestra and chorus of that magnitude, and I think I am right in saying that the difficulty of obtaining accuracy in orchestral and choral music increases as the square of the number of the performers, so that I shrink from suggesting a larger number. Of course the orchestra seats must rise tier above tier up into the angle of the building. An organ is a very useful, almost indispensable adjunct; therefore let us have an organ by all means. But let the greater part of the body of the organ be beneath the orchestra, with, say, the choir organ only visible above, so as to permit the ceiling to be as low as possible, in order that the voices of tenors and basses may be diffused perfectly over the whole building Light for the orchestra and chorus should be obtained from a sun-burner or electric light in the extreme angle of the ceiling, so shaded as to be of the utmost service to the performers, but unseen by the audience: the light would be thrown from behind the chorus and orchestra so as to give them the best possible advantage from it. Ventilation also would be gained by the same means and by perforations in the ceiling ribs and cornice.

By placing the orchestra in the angle of the building, as you will at once perceive, we obviate the difficulties that arise from its position either at the end of a long hall or in the centre of the side of a wide one. Very few of the auditors can receive a double sound, *i.e.*, a direct and an echoed sound, as would be the case if the orchestra was put in the centre of one side of the room, and the average distance between the listeners and performers is materially less in a square than in a long hall.

The auditorium (to seat 5,000 persons) may have a circular arrangement, so as to give every one a direct view, and there-

fore a better hearing of the performers. The circles should be described from a point near the centre of the orchestra, and the levels of seats should be so arranged that those sitting in the rear should have no difficulty in seeing and hearing over the heads of those in front, the seats in the extreme angle opposite to the organ being almost as high as the top of the orchestra. It will readily be seen how, under this arrangement, the sound, travelling along, or rather being reflected, at a very obtuse angle by the ceiling, will reach those hearers who are at the greatest distance as clearly as it will those nearer to the performers. Stairs of the requisite number of steps in the outer corridors would lead to the passages in the different parts of the hall, but with these and other matters, such as offices, cloak-rooms, &c., we have little to do at present.

As to the materials of the hall, great care is necessary in their choice. Regarding, as I do, the ceiling as the great means of sound, diffusion, and conduction, I would certainly recommend wood—the boards being carefully and accurately tongued and glued together, so that each bay should be one large sounding-board. Plastering, in the ordinary sense, is the worst possible ceiling, and in fact is one of the most perfect non-conductors of sound used in building. An alternative to the use of wood is offered in zinc, which would be nearly as cheap and perhaps more efficacious even than wood. The ceiling might be divided by circular and radial beams, perforated for ventilation. and reconciling the eye to the somewhat novel distribution of parts in the hall.

With regard to the walls and their covering, those immediately at the back of the orchestra should be lined with whatever will give the greatest possible reflection to sound. I believe glass to be as good for this purpose as anything commonly used. I have been surprised at the power possessed by looking-glasses of reflecting sound, and, indeed, I once discovered that sounds of voices apparently behind me were really reflected in four mirrors, travelling across the room (a large one) three times before I received them. The speakers were at such a distance that I could not possibly hear them directly.

Large plates of looking-glass on the walls adjoining the orchestra would increase the effect as well as the consciousness of power of the performers, and we know how the inner feeling of success is the parent of further successful exertion. The glasses, however, should not be bedded in flannel as is usual, but allowed to vibrate with every note, reflecting it with the same accuracy as they would a beam of light.

With regard to the remainder of the walls I would recommend boarding or cement, either Parian or Keene's cement, or even good Portland is very hard and elastic, and although cement can hardly be said to be resonant, it affords a highly reflecting surface for sound. Stone would be better, but its

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great cost is almost prohibitive. No doubt, a great deal of the resonance of cathedrals is due to the surface of very smooth and very hard stone inside them.

We have hitherto been considering our model hall as being used only for oratorio or orchestral performances, but if solo or quartet performances are contemplated, a movable screen behind the players or singers might be arranged so as to reinforce the sound in its forward direction, and enable the whole audience to enjoy fully the musical treat to be thus offered them. This screen should be of two thicknesses of wood upon quartering so as to be capable of the greatest possible resonance, and a sounding-board at the top inclined slightly upwards would materially assist in the forward direction of the softer and more delicate sounds.

Many halls are spoilt by excess of reverberation, or by echo, *e.g.*, St. George's Hall, Liverpool. But if we bear in mind the fact which I think I have implied, namely, that the horizontal surfaces, *i.e.*, floor and ceiling, are usually the most important factors in this respect, we shall approach a means of obviating this great difficulty. You will all agree with me that a large room when empty always echoes, and, *cæteris paribus*, the best way of avoiding echo is by a good programme and low prices; but occasionally a hall may be too large for the immediate purpose to which it is put, the weather may be bad or other attractions may prevent the presence of an audience sufficiently large to fill the hall, and absorb those straying sounds which in a half-empty room are so distressing. I would suggest then that if there be a probability of a sparse audience, part of the hall only should be used, heavy curtains being suspended wherever necessary from hooks in the ceiling prepared for the purpose. It would then be possible to make use of a large hall to the best advantage as a small or moderate-sized one, so that under any circumstances it should be available for purposes of both pleasure and profit.

The lighting of the concert-room is a subject of great importance, and I am led to believe that the sources of light should be many (*i.e.*, in the auditorium), and as near the audience as practicable.

Electric lighting is yet in its infancy, but the time may very soon come when numerous small carbon points, hanging by almost invisible wires, shall take the place of the present cumbrous gas-fittings to which we have to look for light.

It may be that in a few years no concert-rooms will be required, but that all houses of a certain rental and upwards will be furnished with telephonic communication so that any preacher on Sunday or any lecture or concert on a week-day may be "turned on," but this at present is a doubtful hypothesis; and, in the meantime, while we are all desiring to hear the best music, and, I trust, all desirous of its salutary

influences being brought to bear upon our race, the subject which I have inadequately endeavoured to bring before you this afternoon will, I doubt not, appear to you as one both of interest and importance.

DISCUSSION.

The CHAIRMAN proposed a vote of thanks to Mr. SAUHDERS, which was carried unanimously.

The CHAIRMAN in inviting discussion said he did not know that he had ever heard before what he might call a sensible paper on this subject. Almost every one he had heard deal with it, declined altogether to consider the real meaning of the term, "good for sound in general," but laid down some sort of empirical rule, which was supposed to bring out a result by a sort of magical process. This was very unsatisfactory, and it was quite clear that it was only by a minute study of the various causes which operated, we could actually get at any good result. We must first know what we want before we know how to obtain it; but, in general, people did not seem to know whether they wanted one of two things—either of which would exclude the other—either that a person should be able to speak with clearness and without any echo, or that music should have the best possible effect. Now it frequently happened that a room in which a person could speak very pleasantly was unsuited for music, while, on the other hand, a room very successful for musical performances, it might be impossible to speak in.

Mr. WILLIAM CHAPPELL said he had always found that when the musical ratios were good, the sound of the room was good. His experience was that a double cube, two to one, such as Wornum's Concert-room in Store Street, was one of the best, if not the very best, he had ever heard; the sound was good there from one end to the other. Some years ago when he was building a house at Ascot, he had every room constructed on musical ratios, either two to three, three to four, or four to five, and he had a very successful house. Still that was not conclusive, because the dimensions were not on a sufficiently large scale to determine the point. He believed St. James's Hall was built mainly through his good opinion of the ratios and of the mode of lighting, the shares being principally held by his family and friends. Owen Jones, having observed the Mosque of St. Sophia, had planned a mode of lighting which should similarly disperse the lights; in fact, they were to be all over, and none at the end. It was found after a time, however, that at the extreme end under the gallery there was a defect in the sound; the directors then put gas-burners

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behind, and the same at the sides under the galleries, and there was no further complaint. Another instance would show the effect of light upon sound. In 1820 his father took the house in Bond Street, and built a pianoforte show-room over the yard at the back. The height was not in due proportion, and the room was lit by a square lantern of about eight or ten feet, raised in the centre. That proved to be the most abominable room for tone that any one could imagine. At that time he had rooms in a small house at the back, and one summer evening while walking out upon the leads, the window of the skylight being open and somebody playing a pianoforte below, he noticed that the whole of the tone seemed to be concentrated in that lantern. He could only assume that there was some interference of light which retained the tone, and prevented its going back into the room. They had recently had the radiometer brought before them, which was a very curious instrument, and its motion could not be accounted for except through the influence of light. He thought, as was suggested by Mr. Saunders, that it would be found there was a certain attraction in light for the waves of sound. When he was young, being on the free list of the opera-houses, he used to go to different parts of the houses to find which was the best place for hearing. In the old opera-house of Her Majesty's there was an enormous chandelier, and the best place of all in that house was the gallery. He was in the theatre when Madame Pasta electrified her auditors by her "Io," in her splendid performance of "Medea," and it was the grandest effect of declamation he ever listened to. He tried all the boxes of that theatre, and found that whenever he was over a chandelier the sound was better than when away from one. For these reasons, he would advise any of the lady-members, if they wished to make a pianoforte sound its best, to put it in a dark corner of the room, and let the auditors be between it and the light. He found, many years ago, when he used to buy a great many pianofortes of Messrs. Wornum, that, having chosen one for its superior tone and marked it, when he went again it had been put into a different position, and another which he had previously rejected, being put into the same dark corner, the tone seemed to be greatly improved.

The Rev. T. Helmore said he could not profess any scientific knowledge of the exact measurements necessary for the best conduct of sound; and with regard to Mr. Saunders' observations on the power of the human voice, he would remark that all voices were not alike. For instance, it used to be said that Whitfield the preacher could be heard at a mile's distance. With regard to the height of a building, he would remark that cathedrals were generally lofty, and that was supposed to add to the beauty of the music which was performed there. He remembered that when he was in Lichfield Cathedral he could

most distinctly hear the octave of his own voice reflected from the groined roof when reading the prayers. There might be something in the multiplication of sounds, harmonics, and so on, which would render one building more favourable than another. He should have rather thought that a lofty building was more favourable to beauty of sound than a low one. When Mr. Hullah was designing St. Martin's Hall he took the same view as Mr. Saunders, that there was an advantage in having the roof not too lofty. He had lately been listening to the services in Westminster Abbey. That was a place in which one would suppose the speaking voice would not travel so well as the singing voice, but he found that he could hear the lessons read, and the sermon of the dean, as distinctly as possible when seated in the middle of the choir.

Mr. G. A. Osborne said he thought it would be well to take Lichfield Cathedral as a model if it increased the range of the voice by an octave.

The Rev. T. Helmore said many no doubt were acquainted with the Town Hall at Birmingham, which he believed was two cubes of sixty or sixty-five feet and ten feet more; that was found to be an extremely good building for sound. He would ask Mr. Saunders whether there were not some great differences in the materials employed in the two buildings he referred to which would account for the difference.

Mr. Saunders said, as far as he could ascertain, the materials were almost identical. There was no assignable cause for the difference.

The Rev. T. Helmore said he supposed it was something like a Stradivarius and a common violin; it might be made of exactly the same size, but it sounded very differently. He would also remark that if the singers were distributed over a large space the sound would be more powerful than if they were too much huddled together, on the same principle as an organ-builder liked to have plenty of room for his pipes to speak in.

Mr. A. J. Ellis, F.R.S., asked if the square building proposed by Mr. Saunders had ever been tried.

Mr. Saunders said no, it was entirely theoretical.

Mr. Ellis said one point to which he had made no allusion was the natural resonance of the volume of air in the room. That varied very much, not merely with the magnitude, but with the shape of the room. In one case which was mentioned it was said that the room was best in D major, and that might have something to do with the natural resonance of the chamber. With regard to the influence of light, it must be remembered there were two kinds of light—daylight and artificial light. He would speak of the latter only, because that was generally employed in the concert-room. That could never be employed without heat, and heat produced a variety of strata in the air in different states of heat and coldness.

Professor Tyndall's experiments showed that wherever you had strata of air of different densities you had reflection and refraction of sound, and thus you might entirely alter the mode of transmission of sound by means entirely invisible. This was always a difficulty with him, with opera-houses; the foot-lamps produced a strongly heated stratum of air between the singers and the audience; and he could not help thinking that that must be a source of difficulty to the singer. Then with regard to empty and full buildings; many years ago, when a student at Trinity College, Cambridge, it was his duty frequently to read the lessons at seven o'clock in the morning in winter time, when there were not more than three or four people present, and his difficulty was to keep his voice down so that it could be heard, in consequence of the echo. On the other hand, it was a part of his duty to read the lessons on Sunday evenings when there were about 500 men in surplices present besides visitors, and then it was with the utmost difficulty he could make his voice heard at all. The difference in the audible properties of the room was very great. He lately lectured in a room at Newcastle-on-Tyne—the Philosophical Institute—which would hold about 1,500 people, and it struck him it was perfectly oppressive from the lowness of the ceiling; but yet, speaking from the middle of one side, he was heard with the greatest ease. With regard to speaking from the corner, there was the great difficulty which Mr. Saunders thought to overcome by putting up curtains when the audience was small, and that ought to be more or less overcome on all occasions. A case occurred within his knowledge many years ago which would illustrate this. Mr. James Chance, of Birmingham, built a large school for his workpeople's children, and when it was completed it could hardly be used on account of the enormous echo; whenever a desk was shut or a book closed, there seemed to be no end to the sound. After some time the ceiling was lined with battens of cloth, and then it was found that the sound died away in a moment, and you could speak with the greatest ease. Something of the same kind had been tried with the double awning in the Albert Hall, but that was a most unfortunate building for any one to speak in. He had been on the platform when speaking was going on, and it was most painful, and he thought for singers it must be *peine forte et dure*.

Mr. Heathcote Statham said he had been accused of having said that only 2,000 persons could hear a symphony with comfort, and he was still inclined to be of that opinion, but his idea of hearing a symphony was a very exacting one. He meant, to hear every instrument with the delicacy which the composer intended, and he certainly thought there was a tendency towards too large concert-rooms; and although he should be very sorry to say anything which would hurt Mr. Chappell's

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feelings, and although he had the highest opinion of the enormous educational importance of the Monday Popular Concerts, he was distinctly of opinion that you did not hear quartet music in a room of that size as the composer intended it. Still he was not prepared to tie himself to the statement that you could not make more than 2,000 people hear. Some years ago he had the honour of reading a paper before the Institute of Architects, in which he went into this question; that paper was now buried in their archives, and he did not think the chairman would say that it was entirely an impracticable paper. At that time he had rather an idea that it was possible to make five or six thousand people hear very well, but it would not be in a square room. The objection he should be disposed to take to that form would be, that in the first place he did not think anybody was likely to build it; it was a very uninviting form of architecture, and opposed to everybody's notion of what looked well. A wide area was always subject to disadvantages, because you increased the possible space within which echo could be generated. When you got beyond a certain size of room, you had between the extreme points of it space long enough for the return echo to come at an appreciably distinct interval from the original sound. His own theory for a concert-room was a long and rather narrow one, and the way he looked at it was this: If there was nothing to prevent the onward passage of sound, and if you broke up the sidewalls so as to prevent lateral echo from them, and destroyed the echo at the further end by galleries or otherwise, the people at the end could hear as clearly as those in front within certain limits, only they would get the sound a little after the others. The sound would go along the room as along a tube, and they would not be disturbed by echo. As to the comparison between the effect of music and the speaking voice, he would remind the meeting that Sir Christopher Wren came to the positive conclusion from experiment that you could not make more than two thousand persons hear clearly. There was a good deal to be said also with regard to placing the audience with reference to the orchestra. It appeared to him that some of the audience in Mr. Saunders' concert-room would hear all first violins and none of the second, or all trebles and no basses in the chorus; therefore the principle of spreading the orchestra could not be lost sight of. The effect of material in giving tone-quality to sound seemed to have been overlooked. Glass was recommended behind the orchestra for reflecting the sound, and no doubt it did reflect sound very sharply indeed; but it was his opinion, based on observation, that the materials exercised an influence on the tone. He had always felt conscious in the Crystal Palace concert-room of a kind of tinny vibration from the glass and iron building, and he thought a large amount of glass would have a

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disagreeable effect on the quality. Again, it was recommended that the walls should be either boarded or covered with cement, but the effect of wood and cement was diametrically opposed. Wood did not reflect sound sharply, but rather sympathised with it and reinforced it, whereas all the cements reflected sound in the sharpest and most disagreeable manner. He had had a great deal of experience in St. George's Hall, Liverpool, where anything like intricate music was impossible. The reference to the radiometer was interesting, but he should be inclined to think that the reinforcement of sound near the chandeliers, which Mr. Chappell spoke of, was more due to heat than to light. There was another point which had not been mentioned, viz., the effect of a draught of air on sound. In the new Opera House at Baltimore they applied ventilation so as to assist the progress of sound from the stage to the audience, and there was an interesting letter in the *Builder* two years ago from the architect, giving a description of it. The building was ventilated by warm air, propelled into the house from the stage end, and the effect was most remarkable, quite beyond what was expected; whilst, on the other hand, all sounds from the house were almost kept away from the stage, and Madame Tietjens said she never sang in a house where she was so little interrupted by noises in the auditorium. The same scheme had been brought forward for a popular Opera House in Paris, and he thought it a very good idea—compelling ventilation by driving air into the room, and making that air the carrier of sound to the audience. That again came round to the notion of a long concert-room. At the same time he was still of opinion that great caution should be exercised not to go beyond a certain size, for he had never enjoyed music in any room of a larger capacity than about 2,000, and he hardly thought it was possible to do so with real satisfaction, although you might come away saying you heard very well, and better than you expected.

Major McCaeagh wished to know if the note of the room remained fixed and unalterable whether it were full or empty, and whether there were curtains in it or not. This fact might be made use of by composers if they knew that in a certain key the note would be so reinforced as to have a better effect than in any other. In his own room he had found the difference of key very striking.

The Chairman said this subject had interested him for some time. Unfortunately he had not met with Mr. Statham's paper, which he believed was not generally known; at any rate he had not come across anybody who had treated the subject in what he might call a rational manner, and it seemed very desirable to ascertain what was really wanted and how to get it, instead of talking in the vague manner which was too common about a room being good for sound, and giving rules

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for making it so. The most remarkable examples he was acquainted with of good and bad rooms for sound were the new Hall of Balliol College, Oxford, and the new Chapel of Keble College. The new Hall of Balliol College was not far from a square room with a low ceiling and open woodwork roof, and there was absolutely no echo in it whatever. You might shout or stamp, or play music in any part of the room, and everything could be heard. Though it was rather dead and disagreeable for music, yet for speaking nothing could be better. In Keble Chapel, when empty, if you played a chord on the organ, holding it down about a second, it would be audible for a quarter of a minute, and the result was, nothing could be heard there at all, and a preacher could scarcely make himself intelligible at all. The difficulty was that neither the architect nor those to whom the chapel belonged would allow anything to be introduced which would have the effect of modifying the appearance of the place. No doubt it could be improved by means of a small velarium or canopy, but whatever was done it must be something which would not interfere with the appearance. In that case there was an immensely high roof; the room was a long narrow one. Balliol Hall, on the contrary, was comparatively flat, and so far the statements of the lecturer seemed to be borne out. As to general principles he did not propose to say much, because we did not know much about them, but there were some things which might be discussed with advantage; for instance, the necessity of getting sound together before you let it issue, so to speak, from the orchestra. If a man stood up and spoke at an ordinary pitch in the middle of a large room, the sound had certain properties for some time after it left his mouth; it would turn corners, and would flow more or less like a fluid. It was not until it issued from an opening which was large compared with the wave length of sound, that you could rely upon it to go straight forward. That was an important thing, and, he had little doubt, was the key to the excellence of the acoustic qualities of the Birmingham Town Hall, in which there was a considerable chamber at one end of the place in which the orchestra was situated, where the whole sound was collected together and issued into the hall from a large opening, so that it would get well together before it issued forth. There had been some recent experiments in a theatre in America on this subject, but he did not know whether they were the same as Mr. Statham alluded to; the ventilation was interrupted at certain times during the evening so as to set the currents of air that were going through the theatre at certain times at cross-purposes, and a number of persons were stationed with instructions to watch at what times they heard better or worse, without being told what was being done.

There was no doubt that when the regular system of ventilation was interrupted, the audience did not hear so well by a great deal as when it was permitted to follow its usual course. That conveyed a lesson which was well known, namely, that complicated currents of air at different temperatures would cut off and interfere with the current of sound inside a building as well as outside, and pointed to the fact that the arrangements for ventilation were a most important matter.

Mr. SAUNDERS in reply said he was much indebted to the kind criticisms of the audience, and especially to Mr. Statham, whose hints he would endeavour to make use of, though he did not agree with him. With regard to the shape of this proposed building, he believed it came as nearly as possible to the shape of a speaking trumpet with the speaker at one end. And it also produced the greatest average nearness of the audience; and with proper care with regard to light, ventilation, and so forth, he thought it might be really successful, although perhaps it might be difficult to find persons willing to put down their money for it in the first instance. He begged to thank the Musical Association for their kind reception of his paper.

May 5, 1879.

JOHN TYNDALL, Esq., F.R.S., LL.D., in the Chair.

ON BEATS AND COMBINATION TONES.

By William Spottiswoode, Esq., M.A., LL.D.,
President of the Royal Society.

The ordinary phenomena of beats produced by two notes nearly in unison are well known. In fact, if the number of vibrations executed per second, or "the frequency" of that note be represented by n, and that of the upper note by $n + m$, then the number of beats per second will be equal to the difference of these numbers, viz., it will be equal to m. The phenomenon depends upon the fact that the more rapid motions of the higher note gradually gain upon those of the lower; and if at one moment the motions are coincident so as to augment the sound, then at the next moment the coincidence begins to fail. This failure of coincidence continues to increase as time goes on; and at last the movements pass into a phase of complete opposition, so that if the two notes are originally of the same intensity, they completely neutralise one another.

Beats are, however, not confined to the case of two notes approximating to unison; they are also produced when the two notes approximate to other harmonies. In the first place, they extend to intervals beyond the octave, harmonious with the fundamental note, for example, the octave itself, the twelfth, the fifteenth, &c. Such intervals would be represented by the ratios 1 : 2, 1 : 3, &c.; to these cases the same rule as that enunciated for unison will apply; in fact, if n be the frequency on the lower note, then $2n + m$, or $3n + m$, &c., will be the frequency of the upper note; and the "disturbed harmonies," as they may be called, will be represented by $n : 2n + m$, $n : 3n + m$, &c. But the period within which these intervals pass through an entire cycle of phases will depend only on the relation between the fundamental note and the disturbance; and consequently the number of beats in each case will be the same as before, namely, m.

If, however, the interval be within the octave, such as the fifth, the fourth, the third, &c., represented by the ratios 2 : 3, 3 : 4, 4 : 5, then the number of beats follows a somewhat different rule. For example, in the disturbed harmony $2 : 3 + m$, the movements will pass through their cycle of phases in half the time which would be occupied in the disturbed harmony $1 : 3 + m$. Hence m will be the number of beats in half a second, or $2m$ the number in an entire second. Similarly in the disturbed fourth, $3 : 4 + m$, the number of beats per second will be $3m$; and so on for other intervals.

Before proceeding further, it will be well to dwell for a moment upon the modes in which two notes forming such harmonies can affect one another. For the present purpose, harmonies may be divided into two classes: first, those in which the ratios expressing them, when reduced to their lowest terms, are those of an odd to an even number, or *vice versâ*; secondly, those where the ratios are those of two odd numbers. These two types have been termed by Sir William Thomson even and odd binary harmonies.*

If we regard such harmonies in respect of, *e.g.*, the air-pressure occurring in them, it will readily be seen that, in an even binary harmony, we pass from a phase of coincident maxima and coincident minima-maxima, to one of coincident minima and coincident maxima-minima; and again to the original phase.

In an odd binary harmony, we pass from a phase of coincident maxima and coincident minima to one of coincident maxima-minima and of coincident minima-maxima; and thence to the original phase.

Beats may also arise from harmonies involving more than two notes, say, from ternary, quaternary, &c., harmonies. In the case of a ternary harmony if only one of the three notes be disturbed, then, in order to calculate the number of beats, we must replace the remaining undisturbed harmony by a note whose period is that of the harmony itself, and then proceed as in the case of a binary harmony. Thus, suppose that we take the ternary harmony 4 : 5 : 6, and slightly disturb the second note, we shall have the disturbed harmony $4 : 5 + m : 6$, and the period of the harmony will be 2; because to four periods of the lower note there correspond six of the upper; but the cycle of the two will obviously be completed twice in that time, or, in other words, the cycle will occupy half that time. The period of the harmony will consequently be represented by 2. The beats on the disturbed harmony $4 : 5m$ will be $4m$ per second; those on the disturbed harmony $5 + m : 6$ will be $6m$ per second; while those on the ternary

* See Sir W Thomson, "On Beats of Imperfect Harmonies," *Proceedings of the Royal Society of Edinburgh*, 1877-8.

harmony, or according to the rule given above, on the disturbed harmony $2 : 5 + m$ will be 2 per second. A comparison of the number of beats in the three cases may readily be made.

It is further to be observed that the beats arising from a ternary harmony are not only slower than those arising from either of the binary harmonies contained in it, but they are far more distinct. In fact, the slightest admixture of a third harmonic note to a disturbed binary harmony is sufficient to bring out in strong relief the beats of the ternary harmony so formed; such an addition, as is probably well known to musicians, affords a ready method of ascertaining whether a given harmony is in tune or not; and if not, by how much it is out of tune.

Returning to the original formation of beats on a disturbed unison, it may be remarked that $n + m = 2n - (n - m)$, and consequently that the interval $n : n + m$ is equivalent to $n : 2n - (n - m)$. This implies that, beside the ordinary beats, a disturbed unison is capable of giving rise to a second series of beats, viz., such as would arise from the harmony $n : 2n$ (the octave), with a disturbance of $(n - m)$, *i.e.*, with the note $2n$ flattened by $n - m$ vibrations per second.

In order to examine this matter more particularly, let us commence with unison or with any other harmonious interval, and gradually alter the pitch of one of the component notes, say, by one vibration at a time, we shall then obtain one, two, &c., beats per second. When the number of beats per second has reached to about ten or twelve, it generally becomes difficult to appreciate them singly by the ear; and the impression of beats is gradually replaced by that of a rolling sound. As the number of beats is still further increased, this rolling sound is replaced by other phenomena to be more particularly described hereafter. These changes continue to occur until the pitch of the upper note reaches midway between unison and the octave; beyond which point, until the octave is reached, the phenomena recur in an inverted order; in fact, when the number of vibrations whereby the upper note is below the octave reaches twelve, or ten, the separate beats begin to be again appreciable, until they come down to one per second, and finally disappear.

The question then arises, what becomes of the beats when their rapidity is increased beyond the limit of the rolling sound described above? Do they form musical notes, or present any other features appertaining to musical notes? Koenig maintains that his experiments answer these questions in the affirmative. If, for instance, we take as our fundamental note the *c*, of which the frequency is 64 per second, and gradually vary the pitch of the second note by a constant quantity, say, two vibrations, until it reaches the octave (the frequency of which is 128), the following

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phenomena may be observed. As far as the interval 64 : 76, the beats may be perceived separately. From 64 : 76 to 64 : 86 (*i.e.*, C : E flat, or thereabouts), a rolling sound may be heard. From 64 : 86 to 64 : 107 (C : A, or thereabouts,) the rolling sound becomes confused, and is replaced by what may be described as a kind of rattle. From 64 : 107 to 64 : 118 (nearly C : B) the rolling sound is resumed. And finally, from 64 : 118 to 64 : 128 (the octave) the separate beats are again perceived. But beside this, in the range from 64 : 90 to 64 : 100 it is found that the lower beats, which range from 28 to 38 per second, interfere with the upper beats, which range from 38 to 28, and form a series of secondary beats, precisely as they would if they were themselves musical sounds. In fact the following secondary beats are formed :—

Intervals.	Beats.		
	Lower.	Upper.	Secondary.
64 : 92	38	36	8
64 : 94	30	34	4
64 : 96	32	32	0
64 : 98	34	30	4
64 : 100	36	28	8

The same phenomena of secondary beats may be observed with other harmonies, and with other fundamental notes. From these facts it appears that beats have this in common with musical notes, that when the frequencies are such as to produce a disturbed harmony, they are capable of interfering and producing secondary beats.

If we take as another instance a harmony of high pitch, in which the frequency of the beats is well within the range of musical frequency, we shall find similar evidence for supposing that beats can form musical sounds, or beat-notes, as they may be not improperly termed. The interval 1024 : 2304, $c''' : e''''$ will give $3204 - 2 \times 1024 = 2304 - 2048 = 256$ beats; and the effect upon the ear is similar to that of the same number of original impulses, and produces the effect of the note c'.

Again, the interval 1024 : 3413·3, or $c''' : a''''$, will give 341·3 lower and 682·6 upper beats, corresponding to f' and f'' respectively. The former of these two notes may, in fact, be heard loud, and the latter faintly.

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Once more, the interval 2048 : 2816 will give 768 lower and 1280 upper beats; and the two corresponding notes, g'' and e''', may be distinctly heard; moreover the two notes 768 and 1280 will give 512 secondary beats, *i.e.*, the secondary beat-note c''.

We have thus seen that beats when sufficiently numerous appear to coalesce and form beat-notes, and to influence one another exactly as ordinary notes. And not only so, but, even when the number of beats is insufficient to produce a distinctly audible note, they appear combined so as to produce a series of secondary beats. The impression on the ear is therefore the same as if there were no difference in effect between beats and the aerial impulses to which musical sounds are ordinarily due.

There is, however, this peculiarity to be observed, that the beat-notes come out more distinctly in proportion to the loudness of the primary notes themselves. And in many cases the periodicity in question may be heard both in the form of a whirr or rolling sound, and also as a beat-note at the same time. In such cases we have only to remove the ear further from the forks in order to lose the beat-notes entirely. On this head Koenig comes to the conclusion that not more than 32 beats per second are necessary to form a note, but that beats to about 128 per second can be distinguished, in intervals of any extent that may be desired; and, lastly, that between 32 and 128 beats per second, beats and beat-notes can, under suitable circumstances, be heard together.

Beside beats there is another class of sounds which may be produced by two notes sounding simultaneously. Helmholtz proved mathematically that "whenever the vibration of the air or of any other elastic body set in motion by two primary notes at the same time becomes so strong that the vibrations can no longer be considered infinitesimal, vibrations of the air, whose pitches are equal to the difference and to the sum of the number of the vibrations of the primary notes, must necessarily arise."

In fact, if with a series of tuning-forks forming a harmonic series, *i.e.*, those whose vibrations are in the proportions—

$$1 : 2 : 3 : 4 : 5 : 6 : 7 : 8,$$

the notes be sounded two and two with sufficient loudness, the difference note $2-1=3-1=$ and $c=1$, will be heard, and if the actual notes of the forks be—

$$c : c : g : c' : e' : g' : b' : c'',$$

the common difference tone will be c. If alternate pairs of

notes be similarly sounded, we shall obtain the difference tones

$$3-1=4-2=\&\ c=2,$$

and so on for other combinations.

Now, since these tones, like the beats, depend upon the difference of the frequencies of the primary notes, it becomes a matter of interest to inquire in what relation the two stand to one another. As far as the lower beats, or beat-notes, of a disturbed unison are concerned, the two are identical in pitch, and cannot therefore be disentangled, but both with the upper beats, and with the beats of a disturbed harmony other than unison, the case is different.

Following out the principles laid down in an earlier part of this paper, the general formula will be found to be contained in the subjoined table :—

Interval.	Beats, or Beat-Notes.		Difference Tones.
	Lower.	Upper.	
$n : n+m$	m	$n-m$	m
$n : hn+m$	m	$n-m$	$(h-1)\,n+m$
$kn : hn+m$	km	$kn-m$	$(h-k)\,n+m$

from which it is easy to select the cases in which the beats or beat-notes are distinct from the difference tones.

The following is an example :—

Interval.	Beat-Notes.		Difference Tones
	Lower	Upper.	
$c''' : b''' = 8 : 15$	$b'' = 7$	$c = 1$	$b' = 7$
$c''' : b''' = 4 : 9$	$c' = 1$	$g'' = 3$	$e''' = 5$
$c''' : f''' = 3 : 8$	$f'' = 2$	$f' = 1$	$a''' = 5$

But of these only the beat-notes are to be heard, while the difference tones are imperceptible. Koenig, however, succeeded in proving the existence of the latter by means of auxiliary forks which gave a certain number of beats with the notes in question. This shows that the difference tones, although true phenomena, are far weaker than the beat-notes.

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It will be worth while to take one or two examples from a higher part of the scale:—

Interval.	Beat-Notes.		Difference Tones.
	Lower.	Upper.	
2048 : 2304	128 = *c*	—	—
2048 : 6826 6	341·3 = *f′*	682 6 = *f″*	2389·3
4096 : 7680	—	128 = *c*	3584

Lastly, as regards the summation tones; these, as Helmholtz's theory shows, are so much feebler than the difference tones that they can be heard only under exceptionally favourable circumstances. And all that need here be remarked, is that, in order to be sure of their real existence, we must use notes which are free from the higher harmonics. The reason of this remark will be seen from the example here subjoined. If the interval be the fifth (2 : 3), the summation tone will be represented by 5. But if each of the notes constituting the interval have four harmonics present, we shall have the following assemblage of notes:—

2, 4, 6, 8, 10;
3, 6, 9, 12, 15.

But the beat-note, or the difference tone of 10 : 15, will be 5; so that in such a case there will be no independent evidence of the existence of the summation tone.

The principle of the foregoing remarks is perfectly general, for if we have any interval, say $m : n$, each note of which presents k harmonics, then the beat-note, or the difference tone of the kth harmonics, will be $k\ (m - n)$, and this will coincide with the summation tone of m and n; if

$$k = (m + n) : (m - n).$$

Koenig has, however, succeeded in hearing summation tones under favourable circumstances with very massive forks, which are much more free from overtones than slender forks. He has also demonstrated their existence in other cases by means of auxiliary forks.

DISCUSSION.

The Chairman proposed a vote of thanks to Mr. Spottiswoode for his most interesting paper, which was carried unanimously.

The CHAIRMAN then said he had heard the paper with great interest, but he should like to make one remark with regard to the summation tones. When engaged on subjects connected with that of the present lecture, he had frequently tried to hear the summation tones, and was never able to do so; but that was, no doubt, due to want of practice, or to a certain defect of musical perception. He remembered that, some years ago, Koenig was ardently engaged on these questions, and the earnestness with which he worked was perfectly manifest from the tables placed before them, and he then understood Koenig to be of opinion that he had overthrown the theory of Helmholtz with regard to combination tones, and established the old theory of Thomas Young. No doubt, there were some gentlemen present who would be able to throw light on this question, and to state whether they agreed with the theory of Helmholtz, or were inclined to fall back on that of Young. A very simple way, he knew none simpler, for producing these resultant tones was, with singing flames, which might be altered by means of a slider, so that the pitch of one might be varied to any required extent. The effect on the ear was very curious indeed, the variation of the combination tones becoming strikingly manifest as you varied the notes of the flames. Helmholtz found that in the middle and higher regions of the scale the maximum discordance was produced by 33 beats a second, and that they were heard up to 132 beats a second. No doubt, they should learn from the lecturer, or some one present, wherein a succession of beats, 33 in a second, differed from ordinary simple pulses of the same period; for if these followed each other at an interval of 33 in a second, you had a smooth musical note. He did not understand why, if Young's theory were correct, 33 beats a second should produce what Helmholtz described as an intolerable discord.

Mr. A. J. ELLIS, F.R.S., said he believed he was in possession of some printed information on this point, which was not yet generally known. Dr. Preyer, Professor of Physiology in the University of Jena, had been making a very careful series of experiments on Koenig's results, and had published a set of four papers which he held in his hand. The first paper dealt with what were the deepest tones, without partials, which could be heard; the second, with the combinational tones and the upper partials of forks; the third, with the theory of consonance; and the fourth, with the smallest differences of pitch which were perceptible. It was the second of these series of experiments which specially bore on Koenig's results. By a series of experiments, which he must ask the meeting to take for granted, Dr. Preyer established, to himself at any rate, that there were no tuning-forks without partials. He had found in a 128 fork as many as 10 partials, in 256, 5; in the third above that, 4; in the fifth above, 3; and in the double octave,

which was the ordinary *c*, he found the octave. He found the octave existed in every tuning-fork he had yet come across. He (Mr. Ellis) had no doubt of that whatever, because he was constantly using that fact in determining musical pitch. That very morning he had to determine certain pitches of low notes, far lower than the forks he used, and he determined them entirely by the octaves which could be got out. He wished specially to dwell on the fact that even with resonator tubes you had at least the octave. Then Dr. Preyer showed that, by taking two tones and their two octaves, you were able to produce no less than sixteen different beat-tones, which varied in intensity on account of the number of ways in which they could be produced. Amongst these came the summational tones. The summational tone was a beat-tone of the second order. If you took two and three, and their octaves four and six, the two and three together produced one, and, taking the secondary beat, one and six produced five. The observation of that was first made in a private way by Georg Appunn to Professor Preyer, and he had worked it out most thoroughly. He had also established that the combinational tones were all subjective; that they did not exist (unless Dr. Tyndall's sensitive flames show otherwise, and that would have to be very carefully examined)—that is, they did not produce any effect, except upon the ear of the listener; they would not, for example, produce sympathetic vibration in forks. He got seven forks so exceedingly sensitive that merely the movement of the hand before them would set them in vibration, and it was necessary to perform his experiments alone and at midnight in order to avoid disturbance. Professor Mayer had not only been obliged to do that for some experiments, but to go out into an open field several miles out of town, and then he was disturbed by the grasshoppers. Dr. Preyer found in getting combinational tones that some of them excited the forks by sympathetic resonance and others did not, and when he examined them further he found that without the combinational tones one of the tones alone excited them by means of its partials. The result, therefore, was that, as Koenig pointed out in the beginning of his paper, his results were the same as if the forks had partials, and Dr. Preyer proved that they always had, and that Koenig's results were, in fact, the results of partial tones. He mentioned it now without any further authority than Dr. Preyer's, in the hopes that Mr. Spottiswoode would carefully examine the paper, because it was of prime importance on this subject. Dr. Preyer then examined the question with regard to the theory of Thomas Young and Helmholtz. Young supposed that when the beats were so quick that you could no longer hear them they produced a beat-tone. That was entirely opposed by the fact which he (Mr. Ellis) had brought forward in a note to his edition of Helmholtz, and

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which was mentioned also by Koenig, namely, that you could hear both the beats and the beat-tone. As for the 132 beats per second, he did not know exactly what were the limits; he could not count them, but by his concertina he was able to produce a very rapid rattle of beats quite distinct from each other, and the beat-tone was as distinct as possible.* He had mentioned beat-tones at the present moment because Dr. Preyer, although he rejected Thomas Young's theory, that the beats became too fast for you to hear, and therefore produce a tone, was of opinion that the tones were beat-tones and not differential tones—that the differential tones were in fact beat-tones. They might exist, but you did not detect them. The summational tones, on which Helmholtz relied for upsetting the theories, he considered were merely beat-tones of the second order, and the other cases which Koenig had brought forward could be explained in that way. It was only in one or two cases that he found it necessary to proceed to the third partial. There was a table at the end of the paper, in which he gave all those of Hällström and also of Koenig, and showed that they could be brought out by this means. Then he said that the combination tones, whether differential or summational, did not exist objectively independently of the ear, but that they were, he did not know in what way, formed in the ear. Dr. Preyer was not a physicist by profession, but a physiologist, and all his experiments had been made in the interests of physiology. About two years ago he (Mr. Ellis) gave an account of his paper on the sensitiveness of the ear, the object of which was to determine the absolute amount of divergence from a just interval which could be detected. There was also another set of experiments in this paper of great importance. He had shown that, without partials when you could avoid them altogether, there was no harmony at all—that you could not detect an error of harmony; of course those who were used to it would detect an error of melody, but that was not to the point; you did not hear any beats whatever if there were no partial tones, that is to say, except the tones were so near to one another that they caused beats.

Lord Rayleigh said no doubt these matters were very difficult and delicate to experiment upon. He had tried several experiments at various times, but could never satisfy himself, and did not feel any certainty as to the results at which he had arrived. It was therefore a source of great gratification that Mr. Spottiswoode had taken up this question with first-rate apparatus, which went for a good deal in those experiments, because the effects to be listened for in so many cases were so

* Here Mr Ellis had intended to mention that Dr. Preyer accounted for hearing *both* beats *and* beat-tones simultaneously, by supposing beats or noises to be heard in the semicircular canals and tones in the cochlea.

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feeble that unless exalted by the use of the best possible apparatus they escaped attention. All experiments of this kind had to be conducted at midnight, and Sir William Thomson said that he could do nothing at all in the daytime. That would give some idea of the exceeding delicacy of the matter. He had not given much attention to the subject of the paper, but he felt considerable difficulty in understanding how it was that beats, no matter how frequent, should give rise to a note having a pitch equal to the number of beats. It seemed to him that the two things were entirely different. If you had two notes whose frequencies were 1,000 and 1,100, they might be supposed to give when sounded together a fractional 100, and that was supposed to pass into a note whose frequency was 100. The difference between the two cases seemed to him to be immense. In the case of a beat whose frequency was 100, what happened was, that during $\frac{1}{100}$th of a second, the motion of the air or of the drum of the ear, or whatever it was, was backwards and forwards ten times, and that not on the whole 100th of a second more one way than the other; whereas in the case of a pure tone whose frequency was 100, during one 200th of a second the excursion was on one side, and during the following 200th it was on the other side. It seemed to him, therefore, that there was no reason *à priori* for expecting beats repeated 100 times a second should give rise to a note of the pitch of 100. If they did so, as there seemed some reason for thinking, it certainly was a very surprising conclusion, and required all the examination that could be given to it. He believed the view, commonly called Young's view, was also that expounded some time before by Smith in a treatise on Harmonics which had been called a large and an obscure treatise. De Morgan published, in the Transactions of the Cambridge Philosophical Society, an analysis of Smith's book, which was certainly more intelligible than the original.

Mr. A. J. Ellis said the remarks of Lord Rayleigh reminded him that Dr. Preyer also mentioned experiments he had made with regard to the possibility of beats producing tones: the experiments he believed were mentioned in Koenig's paper. He had a disc with holes in it, rotated before a tuning-fork, and no matter what the pitch of the fork was, provided that the disc did not move faster than the tuning-fork, you got the same note arising from beats of interruption. He believed Koenig found it was a beat-tone which was always readily heard. There was also this fact, that the differential tone of Helmholtz would be very weak indeed, and would require a very large excursion, but this beat-tone or whatever it was, could be heard when the tones were very gentle; they might be reduced quite to pianissimo, and yet the resulting tone would be heard.

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Mr. BOSANQUET said he had at various times given some attention to this subject, and had formed a strong opinion upon it. He read Koenig's paper very carefully when it came out, and he certainly made out his point satisfactorily, as far as the experiments cited went, if it were true that the tones he used were free from harmonics. He then set himself to clear up that point, and he could only assure Mr. Spottiswoode that he would undertake to make him hear the harmonics up to the seventh on any of the forks he had there. He had repeatedly heard them himself, and so had a friend of his, whose ear he was sure every one would trust. To get them up to the seventh it required some special provisions, but he never used resonator boxes; he generally placed large discs on the ends of the forks, and with the use of a resonator of the required pitch you got the note immediately, and sometimes almost over the room. There was no doubt in his mind that all forks, if struck with any moderate force, produced a considerable number of over-tones. That being so, it seemed to him that the experimental results of Koenig were only what would be expected on the theory of Helmholtz. He was glad to hear Lord Rayleigh's exposition of the process of beats, which seemed to him unanswerable. He could not see how a beat could pass over to a tone, but there was one further point, which he owed first to Lord Rayleigh's suggestion. If you had 100 successive swells per second, the character of the two successive swells was not the same. Suppose the whole process of the beat to be represented by a wheel turning round—getting larger and larger, and then shrinking away to nothing at the termination of the beat; when it began to grow again, it did not, so to speak, grow in the same direction, but in the opposite direction; or, to put it in another way, supposing it represented by a pendulum swinging, it was not a pendulum simply reduced to rest, and then swinging again; but it was reduced to rest by a force continually acting against it, and then setting it to move in the opposite direction. So that in the middle of one beat, so to speak, if the particle was at the extreme one way, in the middle of the other it would be at the extreme the other way, and the successive beats would be in opposite phases. It was quite impossible, to his thinking, that an impression of that kind could result in a continuous tone of any kind; if it did, it would unquestionably be a tone of twice the period, not of the same period as the beat. His judgment as to difference tones and beat-tones did not quite coincide with Mr. Spottiswoode's. He always found that the ordinary experiments for difference tones produced them in much greater strength than the beat-tones heard to-day. He heard all the difference tones, but he had the greatest difficulty in hearing many of the beat-tones at all. There were a number of by-points connected with difference tones, of great

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interest, one being the very curious circumstances under which the production of different difference tones was favoured. He had in one apparatus got the normal difference tones quite easily; in another, standing in another part of the room, probably in consequence of something in the room itself, where he would have expected to get C from a chord he obtained G. What the reason of it was he did not know. As far as his own opinion on the main question was concerned, he was decidedly of opinion that nothing brought forward by Koenig had shaken the position of Helmholtz; though if Mr. Spottiswoode were of a different opinion he should feel his own view very much shaken.

Mr. Spottiswoode said he would not prolong the discussion, partly on account of the lateness of the hour, and partly because he had performed a useful function in eliciting a clear statement of different opinions on a problem which was certainly not completely solved. One great difficulty in these questions arose from the fact that the physical and physiological questions were constantly running into one another, and it was rarely that eminence was attained by the same individual in both of these branches of knowledge. If the existence of harmonics in tuning-forks themselves were clearly established, that fact must materially modify the conclusions to which Koenig had arrived on this point. But it would be necessary to be very clear in distinguishing between two very different things: first, that an instrument may itself give out harmonics; and secondly, that it may excite harmonic notes in others. As regards the combination of beats into a beat-tone, he must confess that question was not unattended with difficulty, but until it was proved that the overtones were present in these forks in any considerable degree, no other explanation occurred to him consistent with the phenomena which had certainly been heard. He was very glad to have heard the views of the distinguished acousticians who had spoken to-day.

The Chairman remarked that instead of being disappointed with Mr. Spottiswoode for not having brought with him further apparatus of defensive warfare, they would all be rather inclined to admire him as one that multiplied himself amongst mankind, embracing all their talents, and taking part in every scientific work going forward.

On the motion of Lord Rayleigh, seconded by Mr. A. J. Ellis, a vote of thanks was passed to Professor Tyndall for his kindness in presiding.

JUNE 2, 1879.

G. A. MACFARREN, ESQ., MUS. DOC., M.A.,

IN THE CHAIR.

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*ON FORM IN MUSICAL COMPOSITION.**

By CHARLES E. STEPHENS, Esq.

ON receiving the invitation of the Council of this Institution to read a paper on Form in Musical Composition, my first impression was that so comprehensive a subject could scarcely be treated within prescribed limits, which would admit of little more than a dry and incomplete catalogue of the numerous kinds of musical composition to which the word form is applicable. It occurred to me, however, that by taking the subject as referring to movements of large scope, and comprising numerous component parts, I might select *one* form of such works, analyse it more fully than has been attempted in didactic treatises, and so present a paper of reasonable duration, and, as I hope, not without some features of interest. It will doubtless be anticipated that I have chosen for my remarks that most important form of instrumental composition known as the Modern Binary or Grand Duplex—the general form of the great majority of modern classical overtures, and of first (and frequently also of other) movements of symphonies, sonatas, and the whole range of concerted instrumental music. I premise that I purpose treating my subject chiefly from the scholastic point of view, not only as being most in accordance with the general objects of our meetings, but because the æsthetic or poetic aspect would lead us too far into the regions of speculation and romance.

The general outline of a fully constructed movement in the form in question comprises a first principal subject, idea, or motivo, in a certain key; secondly, a connecting link, cause-

* Illustrated on the "New Patent Vocalist's Double Oblique Pianoforte," invented by John C. Ward, Esq., and manufactured by W. Whiteley, 147, Queen's Road, Bayswater.

way, or bridge, leading to a new key; thirdly, a second principal motivo, with accessories, &c., in this new key: these three divisions constituting the first part of the movement. Then, fourthly, the artistic development of all or some of the preceding features, together with, in some cases, new ideas; fifthly, a resumption of the first motivo, either as at the outset or with sundry modifications; sixthly, a repetition of the connecting link which appeared in the first part, but now generally modified, and especially with a view to its leading eligibly to seventhly, the second principal motivo and its accessories, transposed into the initial key of the movement; and eighthly, a peroration or coda. The scheme naturally admits of sundry modifications other than those already stated, without destroying this general outline. Let us now examine each of these divisions somewhat more in detail, adducing a few universally known examples which may best illustrate some points, but partly delaying this till I come to my analysis of some of Beethoven's Pianoforte Sonatas, which you have been invited to bring, with a view to following my remarks by reference to the text.

It frequently happens that such a movement as I have described is prefaced by an Introduction, sometimes of considerable extent, as in Beethoven's seventh Symphony, in A, Op. 92; Mendelssohn's Symphony in A minor, Op. 56 (known as the "Scotch"); but more frequently of less extensive proportions, as in Weber's overtures, "Der Freischütz" and "Jubilee;" Mozart's overture, "Don Giovanni," and Symphony in E flat, Op. 58; Beethoven's Symphonies in D, Op. 36, and B flat, Op. 60; and sometimes comprising only a few bars, as in Mozart's overture, "Die Zauberflote;" Beethoven's Septet in E flat, Op. 20, and first Symphony, in C, Op. 21. The Introduction does not, as a rule, follow any definite plan, and it may either foreshadow some of the features of the movement which it ushers in, as in Beethoven's overture, "Egmont," or, in the case of operatic overtures, some of the themes of the opera itself, as in Spohr's "Jessonda," or it may consist of independent thoughts, as in most of the other works I have mentioned. The Introduction most naturally ends on the dominant of the key of the succeeding movement, but it may end more capriciously with good effect, as in Beethoven's Sonata for Pianoforte and Violin, Op. 47 (the "Kreutzer"), and also his Pianoforte Sonata, Op 81 ("L'Adieu, l'Absence, et le Retour"), where it ends on the *subdominant* harmony.

We now pass on to the first principal motivo. It would not be easy to describe why any particular musical idea is more eligible for this than for a second principal motivo, but we find that the former mostly depends less directly on melodic interest than the latter. Sometimes the first principal motivo consists

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of a mere passage, as in Mozart's overture "Così fan Tutte," and Beethoven's, "Prometheus." Sometimes it commences with some such passage, immediately followed by something more melodic, as in Mozart's overture, "Le Nozze di Figaro," and Weber's, "The Ruler of the Spirits." Sometimes it is the subject of a fugue, of which what is termed the exposition occupies this division of the movement, as in Mozart's overture, "Die Zauberflote." Less frequently it assumes a more decidedly melodic character, as in Sterndale Bennett's charming overture, "Die Najaden;" the first movement of Beethoven's Sonata for Pianoforte and Violin, in F, Op. 24; and notably in the first Allegro of Spohr's Symphony, "Die Weihe der Tone." In the two works last named, the second principal motivo is decidedly inferior in melodic interest. I may also refer to the first movement of Weber's grand Pianoforte Sonata in C, Op. 24, in which the first principal motivo is a *cantabile*, and the second a mere figure.

It would certainly seem that the most fitting conclusion of the first principal motivo is a tonic cadence in its own key, but numerous cases occur in which it comes to a half-close on the dominant, or merges into the succeeding division of the movement, namely, the connecting link or causeway, leading to the second principal motivo. The causeway often comprises partial developments of any features of the first principal motivo, as in Mozart's Symphony in C (known as the "Jupiter"), or it may be partially or wholly distinct. It may be accompanied even with a change of *tempo*, as in Mendelssohn's Symphony in A minor, already quoted.

The object of the causeway being to lead to a new key, its most natural conclusion is certainly on the dominant of that key, and a dominant pedal-point of more or less extent frequently occurs, with the obvious purpose of introducing the said key with greater importance than other keys which may have appeared in the course of the causeway. In Mendelssohn's overture, "Ruy Blas," this purpose is most effectively enhanced by a recurrence to the opening four bars, in slow time, here transposed, the harmony being slightly altered.

In many works by great masters the causeway ends, *not* on the dominant of the new key, but more capriciously, with good effect, and sometimes *on the dominant of the primary key* (of which numerous examples can be found in the pianoforte and other works of Haydn, Mozart, and others), or (what is identical in notes) even *on the tonic of the new key itself*. A marked case of this occurs in Beethoven's overture, "Prometheus." It must, I think, be admitted that this is, theoretically, the least eligible mode sanctioned by such high authority. On every ground it would seem that the key of the second principal motivo should come upon us with freshness, and it would therefore seem proper not only

that the causeway should not end on the tonic harmony of that key, but that this should, up to that point, be altogether avoided. Instances to the contrary are, however, very common. There is a strongly marked one in the first movement of Mozart's Symphony in G minor, Op. 45. The second principal motivo is in the usual key of B flat, but before the causeway leading to it is half over, that key is anticipated and dwelt in in a most pointed manner. A similar instance occurs in the Finale of the same symphony.

I have now to speak of the second principal motivo. In a movement in a major key this is generally in the key of the dominant major—sometimes in that of the dominant minor, as in Mozart's overture, "Idomeneo;" also in the last movement of his Pianoforte Sonata in F, presently to be further referred to. In a movement in a minor key the second principal motivo is generally in the key of the relative major—sometimes in that of the dominant minor, as in the first Allegro of Mendelssohn's Symphony in A minor, previously quoted; or in that of the dominant major, as in the same author's Trio in D minor, Op, 49. But there are other keys equally available, as, for instance, in Schubert's unfinished Symphony in B minor, where the second principal motivo is felicitously introduced in the attendant key of G major. In the first movement of Beethoven's eighth Symphony, in F, Op. 93, it appears, somewhat erratically, first in the key of *D major*, forthwith modulating into and concluding in the usual key of C. I will presently show cases where other distant keys are used with admirable effect.

The second principal motivo is generally of a more melodic character than the first; but I have already shown cases where these conditions are even reversed. In many works we find a plurality of motivi in this division of the movement, as in Mozart's overtures, "Don Giovanni" and "Le Nozze di Figaro;" the first Allegro (Presto) of Beethoven's "Kreutzer" Sonata, &c.

It seems unnecessary to dilate on the expediency of the second principal motivo contrasting well with the first, for the sake of variety, and especially if both are designed for salient treatment in a succeeding part of the movement. Nevertheless many examples can be cited where this contrast is not very marked, and I will mention one well-known instance by Haydn where there is no second principal motivo, that which stands in its place being merely a transposition of the first into the key of the dominant, with a slight prolongation at the close. It is in the first Allegro of his Symphony in D, No. 7 of the "Salomon" series. As a question of mere teaching, one could not, of course, recommend such a case for imitation, though the genius and genial glow of "Old Papa" make us very readily and pleasurably receive the exceptional point

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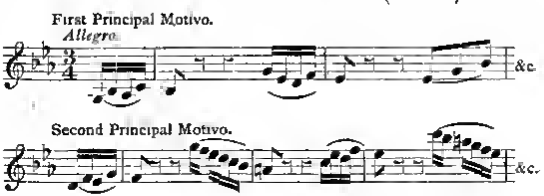
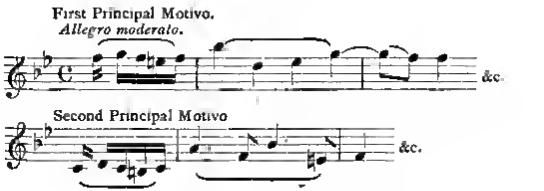
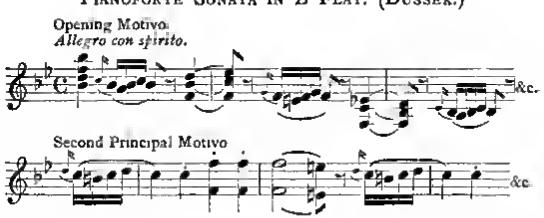
under consideration. Furthermore, in many cases the second principal motivo, though not identical with the first, is clearly suggested, or, as it were, instigated by it, as for example:—

PIANOFORTE SONATA IN E FLAT. (HAYDN.)

PIANOFORTE SONATA IN B FLAT. (MOZART.)

PIANOFORTE SONATA IN B FLAT. (DUSSEK.)

In the first movement of the string Quartet in F, Op. 77, by Haydn, the second principal motivo is engrafted on a figure of the first, placed in a different part to that in which it originally appeared. There is another well-known instance of this in the first Allegro of Mendelssohn's Symphony in A minor.

The second principal motivo is usually followed by accessory ideas of a character to afford consistent relief, and, in a certain type of solo and concerted instrumental music till recently

much in vogue, these accessories chiefly consist of bravura passages designed to exhibit the prowess and digital dexterity of the executants. Examples of this kind abound in such works by Hummel, Moscheles, Reissiger, and others. It is scarcely necessary to remark that in such examples the higher purposes of music are, for the moment, set aside.

It not unfrequently happens that among the accessories there are reminiscences of the first principal motivo, or of the causeway between this and the second principal motivo. And sometimes these reminiscences appear rather as a pendant to the accessories than as a part of them. Several examples will be found in various works already quoted, and more will be referred to in my analysis of some of Beethoven's Pianoforte Sonatas.

We now come to that part of the movement where, in symphonies, sonatas, &c., we commonly find a double bar, with indication of a repeat, and sometimes it includes a few bars in the manner of a conduit, leading back to the recommencement of the movement, as in the Finale of Beethoven's fourth Symphony, in B flat, Op. 60; and sometimes, as in this instance, the conduit is altered at the second time of performance, so as to lead eligibly to the second part of the movement.

There are many cases, in more modern works especially, where the author does not desire repetition of the first part, and the double bar is consequently omitted. The repetition never occurs in modern overtures* or concertos in this form.

I have now to speak of the second part, where the art and science, as much as the genius of the musician, are brought into play. He here develops his ideas, or rather portions of them, combines them with contrapuntal or other devices, and shows, so to speak, of what they are capable. Inexorable time prevents my entering at large upon this most interesting division of my subject, and I pass on to observe that it would seem a cardinal point that the two keys chiefly used in the preceding part of the movement, and to

* Since reading this paper I have been reminded by an esteemed professional friend that the first part of Mendelssohn's "Military Overture" is marked with a repeat. But this work is certainly *not* an overture in the ordinary acceptation of the term. It is simply a *movement*, and it appears to me that Mendelssohn, careful as he was in the composition and revision of his works, was, as in this instance, less so in classifying them. Of this there is strong further evidence in his Op. 22, which was originally published in England as "Rondo Brillante." But it is *not* a rondo, of which the author would seem to have been reminded, as in subsequent editions it appears as "Capriccio Brillante" But *neither is it a capriccio*—a name which, with its cognates, Mendelssohn largely used in designating his pianoforte works, viz, "Caprice," Op. 5; "Rondo Capriccioso," Op. 14, "Three Caprices," Op. 16; "Capriccio Brillante," Op. 22, and "Three Caprices," Op. 33; *all of which are movements of regular design and purpose.*—C. E. S.

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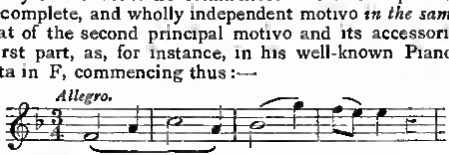
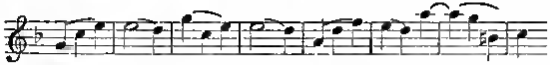
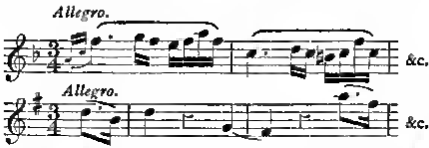
one of which we must eventually return, should now be avoided, except possibly in the most transient and impalpable manner, as in the course of a sequence. I must, however, invite attention to a remarkable contravention of this by several composers of the last century, and notably by Mozart. In many of his works he commences this second part with a new, complete, and wholly independent motivo *in the same key* as that of the second principal motivo and its accessories in the first part, as, for instance, in his well-known Pianoforte Sonata in F, commencing thus:—



The second principal motivo and all its accessories, occupying more than the immediately preceding half of the first part, are in the usual key of C. Yet the second part commences, as I have described, thus:—

and, as if even yet loth to quit the key of C, the whole of the above period is repeated an octave lower. Another instance, to the same extent, occurs in his Pianoforte Duet in C, Op. 15. Others in solo sonatas commencing as follows:—

In Dussek's Pianoforte Sonata in D, Op. 9, No. 3, a similar instance occurs, *followed by confirmatory passages for nearly six bars more in the same key*, so that it may be termed an aggravated case. This peculiarity is nowhere to be found in the works of Beethoven and most other great writers. In some few cases Beethoven here lingers still for a short time in the key of the second principal motivo and its accessories, as in the first movements of his Symphonies in B flat and F, but he never introduces a new and independent motivo in that key. I shall be glad if any of the excellent and observant critics among my audience should make some instructive remarks on this head. Apart from this it would seem another cardinal point that *no other* particular key should here be dwelt in for any length of time, whereby the supremacy of the original tonality might become impaired.

The great latitude not only permissible but essential in this part of the movement has caused it to bear the name of the "Free Fantasia," and it generally consists almost exclusively of such treatments of previous incidents as I have already hinted at, but it is not unfrequent to find new ideas, either homogeneous with the rest, or of a wholly different character. Of the latter I will presently give some examples. Of the former I need only quote from Beethoven's third Symphony, in E flat, Op. 55 (the "Eroica"), where a new subject here appears, first in the remote tonality of E minor, and is afterwards very prominently developed.

If there has been an Introduction, the movement may be interrupted by reference thereto, as we shall see presently; as it may also by totally extraneous incidents, as in Weber's overture, "Euryanthe;" Beethoven's "Leonore," Nos. 1, 2, and 3; and Mozart's smaller specimens, "Die Entführung aus dem Serail," and "La Villanella Rapita."

The free fantasia is often of considerable length. Indeed, from its purpose and restlessness of key, it admits of consistent prolongation more than any other part of the movement, except, perhaps, the coda. The *ultimatum* is a return to the primary motivo, generally through its dominant harmony, though also, capriciously, otherwise, as in the first Allegro of Dussek's beautiful Pianoforte Sonata in E flat, Op. 44, and in the slow movement of Mozart's in G [of which the opening is quoted at page 137], in both of which the division under consideration ends on the dominant harmony of the relative minor. There is frequently a dominant pedal-point here, containing allusions to previous incidents. In the Finale to Beethoven's fifth Symphony, in C minor, Op. 67, there is here a felicitous reference to the preceding Scherzo.

In accordance with one of my "cardinal points" before mentioned, the actual tonic harmony should not be anticipated before the re-entry of the primary motivo; but I cannot resist the temptation to throw aside school for the moment, and claim your unbounded admiration of one of the happiest and most inspired deviations from this rule, in Weber's overture, "Oberon;" in which, just before the close of the free fantasia, two bars of the second principal motivo appear, first in F sharp major and then in D major, in this latter case anticipating the tonic harmony, on which the primary motivo almost immediately reappears. I must also glance at a remarkable instance in the first Allegro of Beethoven's Symphony in B flat, where, for a peculiar effect, the dominant harmony is altogether evaded, and the tonic harmony persistently dwelt in, for a long time before the actual re-entry of the primary motivo.

In some few works of smaller scope and purpose the interesting feature of the free fantasia is wholly absent, the move-

ment being, in other points, unaltered in shape. For an instance I can once more refer you to Mozart's overture, "Le Nozze di Figaro."

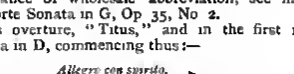
The first principal motivo now reappears, sometimes in its entirety, sometimes abbreviated,* sometimes lengthened, sometimes with varied treatment, as in the slow movement of Beethoven's first Symphony. Sometimes it appears with changed mode, *i.e.*, major to minor, and *vice versâ*. In a few instances this motivo is here introduced in some key other than the primary one, which I will presently illustrate.

This is generally followed by a version of the causeway which appeared in the first part, frequently with modifications, and especially any that may be necessary to lead to the second principal motivo, now transposed into the initial key; sometimes also with modal changes, or curtailments or extensions, or otherwise modified as may be desired by the composer, or expedient to suit the compass, capabilities, or effects of the instruments employed. Among such modifications may be classed one introduced by Weber with grand effect in his three great overtures, "Euryanthe," "Oberon," and "Der Freischütz," namely, the *fortissimo* in lieu of the previous *piano*. In a few cases the second principal motivo here appears, or is at least commenced, not in the initial tonality, but in another, as in the first movement of Beethoven's eighth Symphony, in F, his overture, "Egmont;" Schubert's unfinished Symphony in B minor; and the first movement of Dussek's Pianoforte Sonata in G, Op. 35, No. 2, in which it here appears first in E flat, and subsequently, curtailed, in G, with the accessories †

With this second principal motivo and its accessories so transposed (but not necessarily presented in the same order as at first) the movement in some cases concludes; and, in some works, this second part is marked with a repeat. I believe I am correct in saying it is traditional that *this* repeat was rarely observed; but, in some instances, this tradition would involve a dilemma, as, for example, in Mozart's string Quartet, Op. 10, No. 2, in D minor, where there is not only a repeat of the second part indicated, but it includes a conduit, which is modified the second time, to lead to the coda. If,

* For an instance of wholesale abbreviation, see first movement of Dussek's Pianoforte Sonata in G, Op. 35, No. 2.

† In Mozart's overture, "Titus," and in the first movement of his Pianoforte Sonata in D, commencing thus:—



the free fantasia is immediately followed by the *second* principal motivo, transposed, and the resumption of the primary motivo brings the movement to a close. This is a very unusual modification.

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therefore, the repeat be not observed, part of what Mozart has written must be omitted altogether.

In the majority of instances the work winds up with a coda, more or less extended; and, as the principle of the coda should be *finis coronat opus*, the composer should generally reserve something of interest, brilliancy, or effect, to bring his work to a fitting termination. Transient and extraneous changes of key are here all to the purpose, provided there be a quick and satisfactory return to the primary key, in which it is usual, for obvious reasons, to finally have several confirmatory cadences. The coda may, of course, recall any previous incidents, including those of the introduction, if any. It usually consists almost exclusively of such materials, but may also present new ideas, and may also be accompanied by a change of *tempo*, as in Beethoven's overture, "Egmont;" finale of Pianoforte Sonata in E flat, Op. 81; Mendelssohn's Symphony in A minor, Op. 56; Weber's overture, "Jubilee," &c. A short stay in attendant keys sometimes occurs here. In several works by Beethoven and others we find such stay in the subdominant tonality, as in the first movement of his sixth Symphony, in F, Op. 68 (the "Pastoral"); and I call to mind a special case in an orchestral work by our esteemed chairman of to day. It is a tribute, "In Memoriam," to our distinguished compatriot, Sterndale Bennett. The key is B flat; and in the Coda, *allegro*, the author comes suddenly to a halt on the subdominant harmony of that key; and, immediately converting this into a tonic, he introduces parenthetically, *andante*, a short excerpt from Bennett's quartet, "God is a Spirit," from his oratorio, "The Woman of Samaria," afterwards resuming the thread of the previous discourse. Apart from the pertinence of this interpolation in this particular work, the mode of its accomplishment struck me, at my first and only hearing, as peculiarly successful, and, as far as my memory serves me, it is quite unique.

Time would not permit me to speak on the binary form as applied to modern concertos for a solo instrument with orchestra, nor on many other points of great interest in connection with my exhaustless subject. I now therefore pass on to further illustrate some of my remarks by reference to Beethoven's Pianoforte Sonatas.

In the first Sonata, Op. 2, No. 1, in F minor, the first motivo consists of eight bars only, with a half-close on the dominant. The causeway follows, based on the first and second bars of this motivo. The latter of these two bars is transiently developed for the space of five bars, and we are shortly landed on the dominant of the relative key of A flat major, in which key the second principal motivo now appears. A short melodic accessory idea presently ensues, in which the

tonic cadence of A flat major is confirmed by repetition; and it may be here remarked that while a repetition of any particular cadence is generally to be avoided, it is all to the purpose in the confirmatory manner just described.

The first part of the movement now closes with a double bar, and a repeat is indicated. After the double bar comes the free fantasia, founded for six bars on the first two bars of the initial motivo. Immediately succeed eight bars of the second principal motivo, simply transposed into B flat minor (a proper key to here dwell in for a short time, because an attendant of the primary key), with a little modification at the last two bars thereof, which raises the tonality to C minor (an equally eligible key to similarly dwell in), in which we now have a part of the same motivo. The bass then takes up two bars thereof, and, by a modulating descending sequence, these appear first in C minor, then in B flat minor, and lastly, with slight modification, in A flat major, when, by a few bars which spring from the preceding, we reach the dominant of the original key, on which there is a pedal-point of considerable extent; and at the last six bars before the re-entry of the first motivo we find renewed development of the prominent figure in its second bar. The first motivo now re-enters, and subsequently the original causeway, and the second principal motivo and its accessories, are then all simply transposed into F minor, with very trifling modifications, and a little prolongation at the close.

The finale of this sonata is, according to my diagnosis (for I have seen it described as a rondo), in the same form. We find a first motivo in F minor, merging into a causeway leading to the second motivo in C minor, in which key the first part closes, a very brief conduit leading to its repetition. The second time this conduit is altered, to lead to the related key of A flat major, in which now appears a new, melodious, and largely proportioned motivo, in lieu of the development of previous ideas. At the end of this motivo, the original more vivacious character is resumed, and the movement proceeds regularly to a close.

Let us now turn to the third Sonata, Op, 2, No. 3, in C. The first motivo ends on the thirteenth bar. The connecting link or causeway is here not based on the first motivo, as in the first Sonata, but is entirely distinct, and ends in a manner on which I have already remarked, namely, on the tonic of the second motivo, G. Any purely scholastic objection to this is, perhaps, to a great extent, met in this particular case by the second motivo commencing in the *tonic minor*. This motivo, with short accessories, brings us now to the *dominant* harmony of the key of G, in which key, major mode, an additional motivo now appears. This motivo merges into accessories, which are partly based on the preceding causeway, and with

a few bars, comprising confirmatory cadences in G, the first part of the movement terminates. The second part commences with the usual free fantasia. The first six bars of this are deduced from the bars of confirmatory cadence, just mentioned. A series of independent passages in semiquavers then ensues for twelve bars, leading to the first four bars of the primary motivo, here transposed into D. A figure comprised in this motivo is then developed, mingled with bold progressions effecting the modulations, which gradually lead to the dominant of the original key. The same figure is here pursued on a pedal-point, which duly brings us to the resumption of the primary motivo in that key. I have already said that this motivo is frequently modified in this place. In the case before us it is *lengthened* in a very beautiful manner. The seventh and eighth bars of the melody are transferred, with only a very slight alteration, to the bass, and counterpoint is added above. This is immediately repeated in another key (F), and afterwards inverted, with prolongation, &c., to bring us again to the dominant of C. The movement then proceeds in the regular manner, with the transposition of the second and additional motivi, interrupted just at the close by the chord of A flat, on which the Coda, at first comprising new material, or rather harmonic progression, commences. It leads to a pause—a cadenza ensues, containing further development of the salient figure of the primary motivo. Other parts of this, with homogeneous additions, succeed, and this admirable specimen of Beethoven's genius comes to a close.

In the sixth Sonata, Op. 10, No. 2, in F, the first motivo consists of twelve bars, ending with perfect cadence in the key. A causeway, of six bars only, follows, constructed mainly from the first motivo, and ending, not on the dominant of the new key, but in a more capricious manner already spoken of, on the dominant of its relative minor. The second principal motivo and its accessories then appear, in C. In the free fantasia of the second part let us note how, even from slight material, genius can evolve the most interesting results. The last two bars of the first part consist of notes which may be termed quite common property, But Beethoven takes this slight incident and turns it to account. First it appears in the second part in the (presumable) tonality of A minor; then in that of D minor, in the bass, with an added figure above, in semiquavers. This is then inverted, with fuller harmonies, and after eighteen bars of other material we again return to considerable further treatment of the slight incident in question. The resumption of the original motivo here in the key of D, afterwards brought round to that of F, is an illustration of an exceptional point on which I have already spoken.

The eighth Sonata, Op. 13 (usually known as the "Sonate Pathétique," not, by-the-way, the author's designation), in C

minor, commences with a brief, slow Introduction, chiefly constructed on the melodic phrase set forth in its first bar. This Introduction ends in the usual manner on the dominant harmony. The first motivo of the Allegro merges into the causeway, which at the twenty-eighth bar commences its lead to the dominant of the new key. The second principal motivo opens in E flat minor, but closes in the major mode, in which are also the accessories. commencing with the passages in quavers. At the end of these there is a reminiscence of the primary motivo, such as I have already remarked to be of frequent occurrence in this situation. A conduit of eight bars leads back to the beginning of the movement. On the repetition, the last bar of this conduit is altered to lead to the free fantasia of the second part, which commences with a transposed reference to the slow Introduction, for four bars. The Allegro is then resumed, and is first based on two bars of the causeway in the first part, alternating with what may possibly have escaped the attention of some executants as being founded on the first bar of the Introduction. These, with kindred thoughts, bring us to that very important harmony, the dominant of the original key. After a lengthened dominant pedal-point the primary motivo re-enters. At the thirteenth bar thereof a portion is now taken, and a sequential progression is constructed thereon, to lead to the dominant of the key in which the second motivo now appears. This second motivo, as I have before remarked on as practicable, commences here, not in the expected key of C minor or major, but in that of F minor—an agreeable and consistent departure from strict routine; but in its course (at the tenth bar) it turns aside, and it ends in C minor, in which key the accessories appear with necessary modifications, and with renewed allusions in the Coda to the slow Introduction, this beautiful movement terminates.

But I must hurry on. In the first movement of the ninth Sonata, Op. 14, No. 1, in E, the free fantasia of the second part is noticeable for the appearance of a wholly independent melodic passage of great beauty, commencing at the fourth bar after the double bar, extending over sixteen bars, and leading to the usual dominant pedal point, which at once resumes, in an inner part, reference to the primary motivo.

In the tenth Sonata, Op. 14, No. 2, in G, I desire to remark on the extreme simplicity of construction of the causeway leading to the second principal motivo. It commences at the eighth bar, and is of a more melodious character than is commonly to be found at this point, But notice the bass on which this melodious superstructure is founded. It simply moves upwards by conjunct degrees for more than an octave, till at last the note required, namely, A—the dominant of the new key—is reached, viz., G, A, B, C, C sharp, D, E, F sharp, G,

G sharp, and, lastly, A. After the resumption of the primary motivo in the second part the same simple process is still further pursued in the version of the causeway which there appears, commencing, as at first, on G, A, B, when it recommences in the subdominant tonality, and the whole of the original version is thence transposed, making the bass of the entire passage G, A, B, C, D, E, F, F sharp, G, A, B, C, C sharp, and, lastly, D.

The first movement of the eleventh Sonata, Op. 22, in B flat, affords a happy illustration of the use in the free fantasia of previous incidents, now under a new aspect; the bold staccato octave passage at the end of the first part being here used in a curtailed form, *piano* and *legato*. This movement is also remarkable for the total absence of a coda—a very unusual circumstance with Beethoven. I trust that no modern improver will attempt to add one. The movement requires nothing to constitute it one of the best ever written by the great master. The slow movement of this sonata is also in the same form. The free fantasia consists exclusively of development of the first two bars of the movement, together with the last part of the fourth bar.

In the fourteenth Sonata, Op. 27, No. 2, in C sharp minor (commonly known as the "Moonlight Sonata"—another christening for which the author of the work is not responsible), the finale is in the form under consideration, and affords an instance of the second principal motivo being in the key of the dominant minor.

In the fifteenth Sonata, Op. 28, in D (known as the "Pastoral Sonata"—yet another title for which the author must not be accredited), I wish to direct attention to the extensive use made of four bars of the first motivo (bars 7, 8, 9, and 10) in the free fantasia. It is, in fact, almost wholly constructed on these four bars, or sometimes two and sometimes one of them only. Similar extensive use of one idea occurs in the free fantasia of the finale of the same author's fifth Symphony (in C minor), and in that of the first movement of his eighth Symphony (in F).

In the first movement of the sixteenth Sonata, Op. 31, No. 1, in G, the second principal motivo is introduced, in the first part, in B major, and then in B minor, with accessories. In the second part it appears first in E major, then in E minor, and lastly in G major, with the accessories. I have here to make a remark which may possibly not be without use to the student. Observe the close of the first part of the movement. The last two bars which appear before the double bar are in reality the two opening bars of the movement, which are here, for a special reason, written out again. *But they are also included in the repeat, and not only these, but the succeeding four bars of the second part are also identical with those of the first part.* In

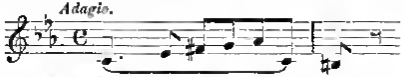
the case of the student whom I would warn, there might, in a similar event, be a dread lest he purposed prodigally bestowing the first part of his movement a *third* time on his hearers. A similar point, but not to the same extent, occurs in the eighteenth Sonata, Op. 31, No. 3, in E flat, and in the ninth, Op. 14, No. 1, in E (for a single bar only).

The first and last movements of the seventeenth Sonata, Op. 31, No. 2, in D minor, afford other instances of the second principal motivo being in the dominant minor. The simplicity of construction of the causeway in the first movement is as remarkable as another case on which I have already commented. It commences at the twenty-first bar, and consists of a development of the first four notes with which the movement opens. This is engrafted on a bass which rises by conjunct degrees till it reaches the dominant of the new key; thus D, E, F, G sharp, A, B, C, D sharp, and, lastly, E. The same simplicity of outline is observable in the free fantasia in the second part of the same movement. Firstly we have, thrice, the four initial notes in slow time, transposed into other keys. We then resume the Allegro, now in F sharp minor, and the bass of the harmonies proceeds by conjunct degrees, just as in the previous causeway; thus, F sharp, G sharp, A, B (two harmonies), C, C sharp, D. We then have a characteristic chord, leading to the dominant of the original key.

In the first movement of the twenty-first Sonata, Op. 53, in C (so well known as the "Waldstein," on account of the dedication), the second principal motivo and its accessories are in E. In the second part this motivo appears first in A major, then in A minor, and lastly in C major. This follows, very closely, the arrangement of keys, as already shown, in the first movement of the sixteenth Sonata. At the resumption of the primary motivo in the second part of the first movement of the "Waldstein" Sonata, there is another of the many instances of Beethoven's power of elevating ordinary things by a touch of his genius. At the thirteenth bar of this motivo, G is here altered to A flat, and this and the preceding bar of absolutely common property are immediately used, by repetition, &c., to prolong this part of the motivo in a most bewitching manner. I regret that time does not permit me to further pursue analysis of this movement, with its splendid Coda. Of the whole work I think it is impossible to speak in exaggerated terms of admiration.

The finale of the twenty-third Sonata, Op. 57, in F minor (known as the "Appassionata"—again not an author's title), is written in the form under consideration, and presents the very unusual feature of the *second part only* being marked with a repeat. The Coda commences with an increase of *tempo* and new material, relapsing afterwards into the figures of the first motivo.

In the twenty-fourth Sonata, Op. 78, in F sharp major, we have an instance of an Introduction (very brief) ending on the tonic harmony of the immediately succeeding motivo. The causeway similarly ends on the tonic harmony of the succeeding second principal motivo.

But now, with much left unsaid, I must draw to a close. If my remarks have to any extent interested you, I feel that I owe it to the exceedingly attractive nature of my subject, and the grand examples at hand for illustration. But, up to the present point, little has been advanced but simple facts, and scarcely anything to call forth one of the objects of our meetings, namely, discussion. I therefore, before concluding, throw down the gauntlet as an avowed champion of form as one of the most important attributes in musical composition. There has been, of late years, a disposition among certain of our continental neighbours to ignore this attribute, and, following suit, young and enthusiastic students have permitted themselves, as composers, to regard form as a fetter to their supposed genius, and, as listeners, have been betrayed into bestowing all their admiration on mere sensuous beauty of sound, and skill or surprise in orchestral treatment, losing sight of the fact that all this may exist in the utter absence of intelligible and constructive music. It was not thus that the true giants in music moved and worked—such men as Handel, Bach, Haydn, Mozart, and Beethoven—and it is to them, I think, that we must still look for that which is truest, and greatest, and best in that art. And in what, I would ask, is the composer who observes form, and thereby renders himself intelligible, at a disadvantage in his own art, or by comparison with those who follow other arts? Are not the architect and the painter eminently students of—I had almost said slaves to—form? Is not the orator, who would rival a Demosthenes or a St. Paul, bound by logic and rhetoric? And even poetry, which, to the thoughtless, would seem of all arts the most free to rove at will, is, in truth, one of the most amenable to law and order. True, we can find *some* happy specimens of music, as we can of painting, in which usual form is not recognisable; and, as one of the happiest of such, in music, I make my last quotation, from Mozart's well-known Pianoforte Fantasia, commencing in C minor, thus:—

and continuing with a series of subjects and passages of quite independent character and in quite unrelated keys. It may be that Mozart was here musically illustrating some story or course of events. Be that as it may, I cannot but acknowledge

that this remarkably irregular work is, to me, by force of the genius of its author, exceedingly interesting, even as abstract music; but, as a champion of form, I must add that the resumption of the initial motivo towards the close, so beautifully led to as it is by a dominant point, is an eminently satisfactory incident in the work, and to a certain extent imparts to it a form, or is at least some evidence of definite purpose. I could go on to show how a knowledge and an appreciation of form lends an additional interest to the mere audition of music, and places within mental grasp, even at a first opportunity, much that would otherwise be far beyond it, but it is now time to let you hear some other voice than mine. It only remains to offer my best acknowledgments to Mr. Ward for placing at my service, for illustration, this specimen of an exceedingly convenient and clever invention of his, and, with many thanks for your patient and flattering attention, I bring my address to a close.

DISCUSSION.

The CHAIRMAN proposed a vote of thanks to Mr. Stephens for his very interesting, instructive, and comprehensive paper, which was carried unanimously.

The CHAIRMAN said the remarks of Mr. Stephens were of great importance. Form was essential and indispensable in every work of art, whether music, oratory, or poetry. The incoherent ramblings of a heated imagination might call forth wonder, but that the work produced should have a right to be classed as an art product, it must fulfil the exigencies of formal development. These principles of form were not the inventions of a day, were not the caprice even of the greatest minds, but they had, since music approached the condition which it had reached in modern times, been evolved by slow and gradual steps upon natural principles. The growth of music to its present consistency was but recent, and compared with the other arts was entirely new; but still we might look back two hundred years, and see already the seed from which modern music had grown. The natural law of harmonics which showed in succession the natural production of sounds, was the basis upon which musical form rested. The most important harmonic after the generator was the fifth, and thus the chord of the fifth was the most important chord, after the chord of the key-note. The key of the dominant in like manner was the most important after the primary key, and their relationships were founded upon harmonic necessity—a necessity because these harmonic sounds were

natural existences which, when brought into art use, were only more strongly defined than they are in the slighter and slighter vibrations that are induced whenever a primary note is sounded. When compositions were more concise than at present, this key of the dominant made ample contrast to the primary key of the piece; but now that movements were more prolonged, another equally certain harmonic relationship, though further advanced in the harmonic series, that of the third, was called into play, as shown in the two examples Mr. Stephens had noticed of a Sonata in G and the Sonata in C, wherein the keys of B and of E were secondarily important. The thing which most obviously struck the listener was the recurrence of phrases, but in his opinion they were of secondary import compared to the distribution and arrangement of keys. Tonality should be regarded as furnishing the real substance of musical structure, and if one were to compare such a structure with an architectural edifice, the height, the breadth, and the material of the building were represented by keys, while the pillars, the carvings, the statuary, and the ornamentation, which more quickly struck the superficial observation, were the themes. The course which had been so clearly mapped by Mr. Stephens of the several portions of a symphonic movement constituted a form as variable as was the human countenance; and when the outcry arose that musical form had been exhausted by the great masters, and that now new principles must be sought, it would be as well to say that the sculptor must seek some other form than the human face and the human figure. Every man who looked into the face of a friend knew it from every other face; and coincidences were so wonderfully few as to be the subject of comedy, where two persons were so perfectly alike that one could be mistaken for the other. With inconceivable smallness of difference in technical detail, complete variety of effect, of difference of idea, might be expressed in music. The recurrence or retrospect of the first part of movements thus constructed was all important in bringing back to the memory of the hearer the incidents at first enunciated; and this had been very happily similated by Miss Prescott to a return journey, when one looked again at the same prospect which one saw in the morning, lit up by the reverse aspect of the sunshine, and figured anew in our mind and made more interesting by the recollection, and by the variety of the change of key, the change of position, and the modification which they underwent.

Mr. Prout thought that Mr. Stephens, when he gave an example of Haydn's Symphony in D as almost the only instance in which the second subject was formed by a variation of the first, had hardly put it strong enough, because in Haydn's pianoforte quartets, and trios, and earlier sonatas, he thought

it would be found to be rather the rule than the exception. The same thing was to be noticed in Clementi's Sonatas.

Mr. STEPHENS said he thought there was no other case where the second subject was exactly the same as the first, though there were many evidently suggested by it.

Mr. PROUT said he had not looked into these things very recently, but it occurred to him this point was of rather more frequent occurrence than would be gathered from Mr. Stephens's remarks. With regard to the movements in minor forms, Mr. Stephens gave an instance from the finale to the Sonata in C sharp minor, in which the second subject was not in the key of the relative major, but in the minor of the dominant. Irregular forms for the second subject were comparatively much more frequent in minor keys than in major movements, of which he might mention two or three examples. These were the last movement in the Sonata, No. 1; the first and last movements in Op. 31, No. 2, in D minor, in which the second subject was in A minor; the Kreutzer Sonata, in which the second subject was in E minor; Beethoven's Sonata, Op. 90; Mendelssohn's Scotch Symphony, in which the second subject was in E minor; Beethoven's Choral Symphony, and in Schubert's C minor. The same thing occurred in Beethoven's Sonata, Op. 111, where the second subject was in A flat. In Raff's third Symphony, in F major, the second subject was in the key of the subdominant instead of the dominant. And, again, in the second part you got it in C when you expected it in F, and it never came to the tonal key at all. This was one of the irregular instances in the movement otherwise admirably regular in regard to form.

Dr. STAINER said Mr. Stephens had thrown down the gauntlet as the champion of form, but it was impossible to have discussion without having some definition, and he should like to know what "form" was. If he were asked to define it he should say it was merely the result of generalisation from the works of the great masters. Students took these works and studied them until they found out the way in which they were constructed; and because the effect was good, therefore they said the rule was good, and then came the rules of art as he understood them. But the tendency always had been, as proved by history, for people, after framing to themselves these rules, to think they could not do better than drive everybody in them, keep them there; and the result was that what was at first the very highest boon became to art its greatest misfortune. Far be it from him to say that anybody had invented a form superior to the beautiful sonata forms they had had so well described; but he very much objected to the word "capricious" being used. You had no right to say So-and-so has capriciously altered the form, unless form were to be like a chain, tying people up to a certain post. The more one studied these great works humbly, the more one began

to feel that the genius of composers was shown quite as much, if not more, in the way in which they escaped from conventionality than from the foolhardy way in which they surrounded themselves with it. There could be no doubt that form, like anything else, had been a gradual growth; and when form reached us following upon chaos it was a thing enormously appreciated. The earliest pleasure, no doubt, as regards music to the human mind was regularity. The first thing that pleased the savage was the beating of a drum; he would much prefer it to the finest sonata, but he liked you to do it perfectly regularly. So people liked regularity in the length of musical phrases, but after that had been perfectly grounded in the people, and they became familiar with it, education sought for some artistic and elegant displacement of the regularity. They all knew people who could not get beyond Handel; they liked the perfect regularity of his sentences; but he in his own mind gave the highest praise to the German writers who boldly dashed through form to see if they could find something new. He was not one who thought that the man who travelled into a new country ought to be ridiculed because he had not discovered anything; the man who was prepared to stake his reputation and run the risk of being laughed at by going into new fields of form deserved the highest praise, and he had no doubt that people would be very thankful to have some other form besides the binary. Therefore, instead of ever using the word caprice, irregular, or licence, with regard to modern German works, he always held his opinion back, in the hopes that some day there should be such a large literature of what would be called capricious pieces that a new set of generalisations might be deduced from them to serve as a foundation for a new series of beautiful forms.

Mr. GILBERT said if they started on the sound basis laid down by the Chairman, that we had natural forms given us by harmonics, we could not depart from them without disfiguring our music. We might vary the order and introduce certain keys before others, and, as Mr. Prout had said, in the symphony "Im Walde" you might have the subdominant instead of the dominant, and the subject reappearing in the dominant when you expected it to be in the original key. But he did not think they could do as Dr. Stainer said, invent new forms, because it was impossible to depart from nature. There were plenty of forms at present, admitting of every possible diversity, but they could all be traced back to nature. There was the binary form, the tripartite form, the rondo, and the free fantasia, and what could they have more, for the last covered everything? The instances given by Mr. Stephens had been most interesting; and the remarks made by Mr. Prout, with regard to variability of the key by the second subject in minor modes must be familiar to all

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musicians. The Chairman had made a remark which he had never before heard, but which struck him very forcibly indeed, as to the analogy which exists between the relationship of keys and the different parts of a building. There could be no doubt that so long as a proper relationship to key was kept, you kept to nature; and so long as the proper materials were used, the building would be substantial; but if you departed from them, and endeavoured to put those stones which should be at the foundation above those which should be at the top, the edifice must crumble to pieces.

Mr. LOTT said the impression left on him by Mr. Stephens was that they should not depart from nature, but might look out for new fields; and he quite agreed with him.

Mr. STEPHENS said the only one thing to reply to was the exception taken to the word caprice by Dr. Stainer. The Chairman had so ably shown the true beauty of the word music, that it was unnecessary to add anything. They could not get rid of the fact that the dominant was the most important note after the tonic, and after that the third was an important note. What he meant by capricious was that, inasmuch as the dominant absolutely fixed and determined the key, if you wished to approach that by any other process it was done, in one sense, capriciously. The chord of the dominant seventh at once decided the key in which you were, and therefore it must be the most satisfactory way of leading to any key. Any other way might be most effectively introduced, but it would be to a certain extent capricious. He would not deny that he had listened with great pleasure to some modern works in which form was not so observable. He certainly should not agree with Mr. Prout in unreservedly quoting from Raff in illustration of what musical composition should be, but nevertheless he had heard works of his with pleasure, as also many of Wagner's; but the giant of all, to him, was Beethoven.

Mr. HECHT (Manchester), as a new member, said he wished to express his sincere thanks to Mr. Stephens for his very able paper. He believed you could reconcile the principles of form with the modern ideas. Schumann had at first tried very much to break through form by writing fantastic pieces, but afterwards he found that he must return to the more severe form; and in his later life he wrote symphonies which were, so to say, a kind of fling at himself. In some of his other works, though of a very different mould from the sonatas of Mozart and Beethoven, nevertheless, even in the most capricious and most fantastic, there would be found to be a form. There was a kind of development of ideas for which you looked in vain in some modern music you heard. As a German he might be allowed to say something about that school which all Germans were believed to be completely under; but he could not say that

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the great creations of Wagner, Raff, and of other modern composers, which went right through the heart of form, could ever come up to the creations of Mozart and Beethoven. He thought it was just the wonderful beauty of form which would always make those splendid pieces live. The greatest charm and wonder to a musician, especially as distinguished from an amateur who only wanted to be amused, was when a small motivo was made so much of that it became a great idea. That was the greatest triumph of art, if a figure could be so developed as to become a picture. For instance, what could be smaller in its idea than the beginning of the ninth Symphony. But what became of this wonderful motivo? He did not know anything in modern music, however brilliant the instrumentation might be, of an idea approaching anything like that. It was most important in the present day that a stand should be made against a mere show of colour for want of design. Design had much greater merit than colour; and as Mr. Stephens justly said, if the artist was to try to alter the human face and the human shape, he would not succeed, and would not find many people come to the Royal Academy and stand before his pictures. Dr. Stainer was no doubt perfectly correct in wishing that people might have freedom, but let them do like their great masters, base their works on the old form. If they compared a suite of Bach with a symphony of Beethoven there was a great difference between the two, but nevertheless you could not fail to see a similarity as regarded the development of ideas. Comparing the symphonies of Mozart and Beethoven, the question occurred to him many times why lately the Mozartian symphony did not make so much impression on an audience as that of Beethoven; and he thought the reason was that in many of Mozart's there was no coda, but generally only a repetition of the second part with a few additional chords and then a finish; whilst Beethoven had nearly always a most interesting coda at the end of the second part which prepared the hearer more for the finish. Beethoven had sometimes altered and enlarged his form, but nevertheless he had not forsaken it. Brahms and other modern German writers had not forsaken form; and he thought Brahms's symphonies would live, for the simple reason that forms had not been stabbed to the heart, but had been enlarged and widened. In fact it would be found that those parts or pieces of the Wagnerian opera which made the greatest impression on the public, such as the overture to "Tannhäuser," were based completely on the old models; it was more like a Weber overture than anything else.

Mr. Orlando Steed thought it would be rash to stand up as an opponent of form, but there would perhaps be less objection to form amongst students if it were distinctly understood that form was in no wise synonymous with cut-and-dried

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shape. He had sometimes used that expression to explain to pupils the distinction between what was mere shape and real living form.

Mr. STEPHENS wished to make one remark on the valuable observation by Mr. Hecht with regard to the absence of a coda. In a great many of Mozart's pianoforte sonatas it was decidedly the case that they ended somewhat disappointingly, because they wanted something to make the closing of the second part more important than the first. Turning again to Beethoven, look at the Coda to the first movement of the second Symphony, which was simply beautiful; it was the crowning point of the whole work. It was there where he was so truly great; although he was great everywhere. That, no doubt, might be to some extent why his symphonies possessed greater interest, because there was a greater sense of completeness than in some of Mozart. In his previous remarks he had mentioned one sonata of Beethoven which was remarkable for the absence of a coda, but it certainly was a case in which he thought none was required.

Dr. STAINER then proposed a vote of thanks to the Chairman, which was seconded by Mr Stephens, and carried unanimously.

The CHAIRMAN, in acknowledging it, said it had been a great pleasure to him to hear the very able paper of his old friend Mr. Stephens, and the remarks which had grown out of it, and which, on the principles that had been enunciated, did not depart from the subject, but simply enlarged it.

A vote of thanks was also passed to Mr. Ward for the loan of the patent piano on which the illustrations were given.

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PROCEEDINGS

OF THE

MUSICAL ASSOCIATION

FOR THE INVESTIGATION AND
DISCUSSION OF SUBJECTS CONNECTED WITH THE
ART AND SCIENCE OF MUSIC.

FOUNDED MAY 29, 1874.

SIXTH SESSION, 1879-80.

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The Authors of the respective Papers are alone responsible for the opinions expressed in them, as well as for the correctness of the illustrations.

RULES AND REGULATIONS

Passed at Three Special General Meetings of the Members, held at 27, Harley Street, W., on February 7 and April 3, 1876, and on January 6, 1879.

OBJECTS AND CONSTITUTION.

THIS Association is called the "MUSICAL ASSOCIATION," and is formed for the investigation and discussion of subjects connected with the Art, Science, and History of Music; and is intended to be similar in its organisation to existing Learned Societies.

It is not intended that the Association shall give concerts, or undertake any publications other than those of their own Proceedings, or the Papers read at their Meetings.

MEMBERS.

The Association shall consist of practical and theoretical musicians, as well as those whose researches have been directed to the science of acoustics, the history of the art, or other kindred subjects.

Any person desirous of being admitted into the Association must be proposed by two members.

Elections will take place by ballot of the members present at any of the ordinary meetings, and one adverse vote in four shall exclude.

No newly elected member shall be entitled to attend the meetings until the annual subscription be paid.

SUBSCRIPTION.

The annual subscription to the Association is one guinea, which shall become due on the 1st of November in each year.

Any member *may*, upon or at any time after election, become a life member of the Association by payment of a composition of £10 10s. in lieu of future annual subscriptions, but in addition to any annual subscription previously paid or due

from such member. Such sums shall from time to time be invested in legal security in the names of Trustees, to be appointed by the Council.

Should members desire to withdraw from the Association, they should give notice to the Hon. Sec. on or before the 31st of October.

MEETINGS.

An ordinary meeting shall be held on the first Monday in every month, from November to June inclusive, at 5 P.M., when, after the despatch of ordinary business, Papers will be read and discussed.

An annual general meeting of members only shall be held at 4 P.M. on the last Monday in October, to receive and deliberate on the Report of the Council, and to elect the Council and officers for the ensuing year.

Special general meetings may be summoned whenever the Council may consider it necessary; and they shall be at all times bound to do so on receiving a requisition in writing from five members, specifying the nature of the business to be transacted. At least one week's notice of such special meeting shall be given by circular to every member, and ten members present at any general meeting shall constitute a quorum.

Every member shall have the privilege of introducing one visitor at the ordinary meetings, on writing the name in a book provided for that purpose, or sending a written order.

COMMUNICATIONS.

Papers proposed to be read at the meetings may treat of any subject connected with the Art, Science, or History of Music, Acoustics, and other kindred subjects.

Papers will be received from or through any member of the Association.

Experiments and performances may be introduced, when limited to the illustration of the Paper read.

All communications read will become thenceforth the property of the Association (unless there shall have been some previous arrangements to the contrary), and the Council may publish the same in any way and at any time they may think proper.

REPORTS.

A Report of the Proceedings of the Association, including the Papers read or abstracts of the same, and abstracts of the Discussions, shall be printed and distributed to the members as soon as possible after the end of each session.

This Report will be arranged and edited by the Honorary Secretary, under the direction of the Council.

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COUNCIL AND OFFICERS.

The management of the affairs of the Association shall be vested in a Council, to be elected by ballot at the general meeting of the members on the last Monday in October.

The Council shall consist of a President, Vice-Presidents, and ten ordinary members of the Association.

The Honorary Secretary of the Association shall be *ex officio* an ordinary member of Council.

The President, Vice-Presidents, Auditors, and five ordinary members of the Council shall retire every year, but shall be eligible for re-election.

At the annual general meeting in October, the Council shall present a balloting list, showing the names of the persons whom they propose for the offices of President, Vice-Presidents, and ordinary members of Council for the ensuing year. A copy of this list shall be given to each member present.

In voting, each member may erase any name or names from the balloting list, and may substitute the name or names of any other person or persons whom he considers eligible for each respective office; but the number of names on the list, after such erasure or substitution, must not exceed the number to be elected to the respective offices as above enumerated. Those lists which do not accord with these directions shall be rejected.

The Chairman of the meeting shall cause the balloting papers to be collected, and after they have been examined by himself and two scrutineers, to be appointed by the members, he shall report to the meeting the result of such examination, and shall then destroy the balloting papers. Auditors shall be appointed at the annual general meeting by the members, and the statement of accounts shall be sent by the Treasurer to the Auditors, and be remitted by them to the Secretary in time to enable the Council to judge of the prospects of the Association, and to prepare their report in accordance therewith.

The Council and officers shall meet as often as the business of the Association may require, and at every meeting three members of Council shall constitute a quorum.

ENACTMENT OR ALTERATION OF RULES AND REGULATIONS.

No rules and regulations can be enacted, altered, or rescinded, except at a special meeting of members summoned for the express purpose, the summons stating distinctly and fully the matter to be brought under consideration.

MUSICAL ASSOCIATION

FOR THE INVESTIGATION AND DISCUSSION OF SUBJECTS CONNECTED WITH THE ART AND SCIENCE OF MUSIC.

FOUNDED MAY 29, 1874.

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FIFTH SESSION, 1878-79.

THE ANNUAL GENERAL MEETING of the Musical Association was held at No. 27, Harley Street, Cavendish Square, on Monday, October 27, 1879.

IN THE CHAIR—G. A. OSBORNE, ESQ., VICE-PRESIDENT.

THE FOLLOWING

REPORT OF THE COUNCIL

Was read by the Honorary Secretary.

IN accordance with the rules of the Musical Association, the Council presents to the Members its Annual Report of the Fifth and now past Session. During its course the usual series of eight monthly meetings has been held, papers have been read, and communications made on various subjects connected with "the Art, Science, and History of Music."

The arrangements for the past Session were as follow:—

First Meeting.—Monday, November 4, 1878. Paper by Shelford Bidwell, Esq., M.A., LL.B., &c., "On Recent Inventions for Reproducing the Sound of the Human Voice." (*Illustrated by Telephone, Microphone, and Phonograph.*)

Second Meeting.—Monday, December 2. Papers by Lord Rayleigh, M.A., F.R.S., (1) "On the Determination of Absolute Pitch by the Common Harmonium;" (2) "On the Mutual Influence of Sources of Sound nearly in Unison."

Third Meeting.—Monday, January 6, 1879. Paper by E. Prout, Esq., B.A., "On the Growth of the Modern Orchestra."

Fourth Meeting.—Monday, February 3. Paper by G. A. Osborne, Esq., "Berlioz."

Fifth Meeting.—Monday, March 3. Paper by the Rev. Sir F. A. Gore Ouseley, Bart., "On the Early Italian and Spanish Treatises on Counterpart and Harmony."

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Sixth Meeting.—Monday, April 7. Paper by C. G. Saunders, Esq., "On Sound in Relation to Buildings."

Seventh Meeting.—Monday, May 5. Paper by W. Spottiswoode, Esq., M.A., P.R.S., LL.D., &c., "On Beats and Combination Tones."

Eighth Meeting.—Monday, June 2. Paper by C. E. Stephens, Esq., Hon. R.A.M., "On Form in Musical Composition."

The attendance at these Monthly Meetings has been generally good, and much interest has been displayed in each of the several topics introduced and discussed.

The Council, in connection with the subject of the attendance at the meetings, desires to remind Members—Country Members especially—of their privilege of introducing a friend at each meeting, either by written order or personally.

The fifth volume of the Proceedings of the Musical Association (which has been forwarded to every Member) contains a most valuable addition to current musical literature and knowledge, and is in itself an ample justification of the hopes and intentions of the founders of a Society which affords an important and acknowledged medium for all whose discoveries or researches have any bearing on the Art, Science, or History of Music. The Council urges upon the Members generally to make the existence and scope of the Musical Association more widely known, and desires to remind them of the rule that communications will be received from or *through* Members, subject to the approval of the Council.

On January 6, 1879, in accordance with a duly signed requisition, a Special General Meeting was held, and the following additions to the Rules were made:—

(*a*) Any Member may, upon or at any time after election, become a Life Member of the Association, by payment of a composition of Ten Guineas, in lieu of future Annual Subscriptions, but in addition to any Annual Subscription previously paid or due from such Member. Such sums shall from time to time be invested in legal security, in the names of Trustees, to be appointed by the Council.

(*b*) The Honorary Secretary shall be *ex officio* an ordinary member of Council.

The Balance Sheet, duly audited, lies on the table for inspection.

The Council congratulates the Members on the fact of the year's expenses having been so kept within the year's income, by the practice of rigid economy, that the balance with which the year began has been considerably increased. A sum of Twenty Guineas, received for two Life Subscriptions, has been carried to a separate account.

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The attention of Members is again called to the inconvenience that results from irregularity in the payment of Subscriptions. At the beginning of each Session the Council has to undertake certain necessary liabilities, in good faith that the Annual Subscriptions will be promptly paid; when, however, Members forget (as some are apt to do) this necessary duty, the commission of the Collector becomes an appreciable charge on the income of the Association, and a most objectionable though perhaps unavoidable expenditure of its funds.

The Council, whilst making this Report of the past Session, and surrendering its trust into the hands of the Members, feels happy in the prospect of the coming one, which gives promise of much interest.

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SESSIONAL ARRANGEMENTS.

SIXTH SESSION, 1879-1880.

First Meeting.—Monday, November 3, 1879.

Paper by EMIL BEHNKE, Esq., "On the Mechanism of the Human Voice." (*Illustrated by a large working model of the Larynx.*)

Second Meeting.—Monday, December 1.

Papers by R. H. M. BOSANQUET, Esq., M.A., (1) "On a mode of producing Continuous Notes from Resonators;" (2) "On some Experiments with a Revolving Stop-Cock."

Third Meeting.—Monday, January 5, 1880.

Paper by A. ORLANDO STEED, Esq., "On Beauty of Touch and Tone."

Fourth Meeting.—Monday, February 2.

Paper by EUSTACE J. BREAKSPEARE, Esq., "On Musical Æsthetics; with especial reference to Dr. Ed. Hanslick's essay, 'Vom musikalisch-Schonen.'"

Fifth Meeting.—Monday, March 1.

Paper by D. J. BLAIKLEY, Esq., "On Quality of Tone in Wind Instruments."

Sixth Meeting.—Monday, April 5.

Paper by G. A. OSBORNE, Esq., "On Chopin."

Seventh Meeting.—Monday, May 3.

Paper by C. K. SALAMAN, Esq., Hon. Mem. Acad. St. Cecilia, Rome, "On Music as a Profession."

Eighth Meeting.—Monday, June 7.

Paper by G. A. MACFARREN, Esq., Mus. Doc. Cantab., &c., "On the Lyrical Drama."

NOVEMBER 3, 1879.

W. H. CUMMINGS, ESQ.,

IN THE CHAIR.

THE MECHANISM OF THE HUMAN VOICE.

By EMIL BEHNKE, ESQ.

THE subject with which I have to deal this evening is a very complicated one, and the time at my disposal is very short, so that I can, at the best, give you but a brief outline of it. I will, therefore, not lose a minute upon any preliminary remarks, but proceed at once with my paper.

Mr. Lennox Browne, with whose name you are all familiar, has just translated and edited a French book explanatory of an admirable "Atlas of the Throat," &c., by Dr. Witkowski, from which I quote the following passage:—

> Physiologists are quite at issue when they endeavour to determine what kind of instrument the vocal organ resembles: indeed Galien compares it to a flute, Magendie to a hautboy, Dupinez to a trombone, Diday to a hunting-horn, Savart to a birdcatcher's call, Biot to an organ-pipe, Malgaigne to the little instrument used by the exhibitors of Punch, and Ferrein to a spinet or harpsichord. The last-named compared the lips of the glottis to the strings of a violin, hence was given the name *vocal cords*, which they have since retained. The current of air was the how, the exertion of the chest and lungs the hand which carried the how, the thyroid cartilages the *points d'appui*, the arytenoids the pegs, and lastly, the muscles inserted in them the power which tensed or relaxed the cords.

So far Dr. Witkowski. Now I am quite willing to admit that the human voice bears more resemblance to a reed instrument than to any other. But when the comparison is pushed to its legitimate consequences, it is found to break down, and we cannot resist the conclusion that the vocal organ is infinitely superior to any instrument made by human hands. Its mechanism is so wonderful as to excite the profoundest admiration, and the more we continue to study it the more we marvel at the wisdom of the Divine Maker who planned it. I shall, therefore, speak of it simply as a wind instrument, composed of

THE BELLOWS, represented by the lungs.
THE WINDPIPE.
THE VOICE-BOX, or LARYNX, and

THE RESONATOR, represented by the upper part of the throat, the mouth and the nose.

THE LUNGS are inclosed in the chest. They consist of two bodies which resemble the shape of a sugar-loaf somewhat flattened and hollowed out at the bottom. They are connected only by means of the windpipe.

THE CHEST is an air-tight chamber formed by the spine behind, twelve ribs on either side, the breast-bone in front, the root of the neck at the top, and the midriff or diaphragm at the bottom.

THE MIDRIFF, or DIAPHRAGM, is a movable muscular partition, separating the lungs from the abdomen. In a state of rest it is arched up, but it flattens by contraction, thus increasing the capacity of the chest at the expense of the abdomen.

THE FUNCTION OF THE LUNGS, as everybody knows, is respiration, which may be considered from a mechanical or from a chemical point of view. Here we are only concerned with the mechanical aspect of the case. We shall get a tolerably clear idea of this subject by examining the lungs of a calf, which are very similar to those of a man. We see the conical shape described before, and how the two halves of which they consist are united by the branches of the windpipe. If we press upon them we find that they are soft and elastic to the touch, and that they emit a peculiar whizzing sound. By blowing into them through the windpipe we increase their bulk to double their former size, and we can keep them in this state of expansion by tying up the windpipe. On reopening the windpipe we find that the air just blown into the lungs escapes again, and that they dwindle down to their original size. Now by drawing a deep breath we produce just the same result upon our own lungs as we did by blowing into the lungs of the calf. By holding the breath we imitate the tying up of the windpipe, and by releasing the breath we are, as it were, untying the windpipe.

RESPIRATION consequently consists of two acts—inspiration and expiration. Inspiration may be carried on in three different ways—First, by flattening the midriff, thus compelling the lungs to *descend*: this I call midriff breathing, the diaphragmatic or abdominal breathing of other authors; second, by extending the ribs *sideways*, which I call rib breathing, otherwise costal or lateral; and third, by *drawing up* the upper part of the chest, which I call collar-bone (clavicular) breathing. In drawing a deep, full inspiration, midriff breathing and rib breathing take place together, with this difference however in the two sexes, that in men the midriff takes a larger share in the work than the ribs, while in women the opposite is the case.

By way of illustrating this curious difference of breathing in men and women, the following anecdote, which has the recommendation of being strictly true, may perhaps amuse my

audience. Sometime ago a troupe of "Female Minstrels" calling themselves, I believe, "The American Amazons," made a tour in this country. Their faces were blackened in the orthodox fashion, and they were in male attire, wearing tight-fitting garments of a peculiar kind. Two friends, both medical men, went to hear them (or perhaps to see them, I am not sure which), when Mr. A. remarked that two of the performers were men. Mr. B. did not see it, even when the individuals were pointed out to him, and asked his friend for the reasons for his opinion. "Why," said Mr. A., "I see it by their abdominal breathing!" And, sure enough, Mr. B. now saw it too, and there was no mistake about it; for in the two suspected individuals the abdomen was evidently moving in respiration, while in all the others no movement was perceptible excepting that of their chests.

The combined forms of midriff and rib breathing are the right method of inspiration, while collar-bone breathing is totally wrong and should never be made use of. The reasons for this are twofold. In the first place the lower part of the lungs is, as we have seen, large and broad, while the upper part is cone-shaped and much smaller. It is clear, therefore, that by inflating the lungs at the bottom we shall get hold of a much larger volume of air than by inflating them at the top. But, secondly, all parts surrounding the base of the lungs are soft and yielding, so that the process of expansion and contraction is carried on without any fatigue, while the very opposite is the case with the parts inclosing the top of the lungs. These are hard and unyielding, so that they cannot be expanded and contracted without great labour, which soon produces exhaustion.

The Windpipe is the channel through which the air is carried into and out of the lungs. It is an elastic tube kept open by eighteen or twenty rings. It enters the lungs by means of two smaller tubes, which in their turn branch out into a number of minor arms, very much like the roots of a tree, which eventually end in the microscopic air-cells of the lungs. The windpipe can be slightly prolonged or shortened and widened or narrowed; it is covered with a mucous membrane which, as the name implies, is continually kept in a moist state.

The Voice-box, or Larynx, is a kind of funnel bent into a triangular shape. It is also known as the "Adam's Apple," and may be felt in the throat at the top of the windpipe. The framework of the voice-box consists of five parts—namely, the ring cartilage, the shield cartilage, the lid, and the two pyramids. You see them represented by this large working model, which enables me to imitate the movements of every cartilage and muscle

The Ring Cartilage is the foundation of the voice-box. It

has the shape of an old-fashioned signet ring; the narrow part of it is in front, and the part corresponding to the seal behind.

THE SHIELD CARTILAGE is so named because it affords protection to the more delicate parts of the vocal apparatus, the real tone-producing element, which it contains. The shield consists of two plates, each of which has two horns. With the upper horns the shield is attached to the tongue bone, and with the lower ones it is fastened to the ring cartilage, in such a way that it can move upon it as upon a pair of hinges. You see here the ring-shield muscles, which go from the ring to the shield, and which have the effect of drawing, by their contraction, the front part of the shield down upon the ring.

THE LID is a flexible cartilage which allows itself to be drawn over the voice-box in the act of swallowing, &c., thus closing it, and preventing food or any other foreign substances from getting into it. I will now remove one of the plates of the shield cartilage, as though cutting it off with a knife. This enables you to see the remaining two cartilages—the pyramids—which were hitherto hidden by it.

THE PYRAMIDS are two triangular little bodies which are perched upon the highest part of the border of the ring cartilage, and which are capable of being moved in different directions with most surprising freedom and rapidity. They are drawn *away* from each other by the back-ring-pyramid muscles, and *towards* each other by the side-ring-pyramid muscles, assisted by the pyramid muscle.

THE VOCAL LIGAMENTS, the real tone-producing element, are two edges of elastic tissue covered with a delicate white membrane, attached in front to the shield cartilage and behind to the pyramids. They are commonly called the vocal *cords*, but this term implies strings, like those for instance of the violin, attached only at either end, and free all round everywhere else. The vocal ligaments, however, are free only at their inner edges. The designation of vocal *cords* is, therefore, calculated to create a totally false idea, and I think the sooner its use is discontinued the better. The stream of air passing between these ligaments throws them into vibrations, and these in their turn cut the stream of air passing between them into regular waves. *In this manner and in this manner alone is vocal tone produced, whether it be called chest, falsetto, head, or any other name.* There are still some who teach different doctrines, and the temptation to refute them is very great; but time is on the wing and I must proceed.

We have now seen that the vocal ligaments are stretched from the front of the shield across to the pyramids, and that these are attached to the upper border of the ring. You also remember that the shield moves upon the ring as on a pair of hinges. If, therefore, the ring-shield muscles contract, thereby approximating the shield cartilage and the ring

cartilage, the result is that the vocal ligaments are put on the stretch. That such is really the case you see when I execute the movements just described upon my working model. The stretching, then, of the vocal ligaments, by which the pitch of the tones produced is raised, is the consequence of the contraction of the ring-shield muscles. These are opposed by the shield-pyramid muscles, which run parallel with the vocal ligaments, and form a solid body with them from the shield to the pyramids. These muscles, having overcome the resistance of the ring-shield muscles, draw the shield cartilage up again, thereby relaxing the vocal ligaments. The effect of this, of course, is to *lower* the pitch of the tones produced; but the shield-pyramid muscles can, under certain conditions, produce the very opposite result by powerfully pressing together the vocal ligaments. They play indeed a most important part in the formation of tone, as may be seen from the fact that paralysation of them causes *total loss of voice*.

We have thus seen that these two pairs of muscles, namely, the ring-shield muscles and the shield-pyramid muscles, by stretching, slackening, and compressing the vocal ligaments, mainly govern the pitch of the tones produced by their vibrations. In a state of repose, however, the vocal ligaments diverge behind, and they must be brought parallel to each other before they are ready for the production of sound.

On my next working model you get a view, from above, of the bases of the pyramids, with the vocal ligaments attached to them. These meet in front but diverge behind, so that the space between them is triangular. This space is frequently, even in scientific works, spoken of as the *glottis*. The proper translation of this word, however, is tongues, or tonguelets, and it signifies the vibrating element in the voice-box. It is manifestly wrong and confusing, therefore, to make use of the same term to designate the space just mentioned, which should be distinguished as the *chink* of the glottis, or the *vocal chink*.

I now imitate the action of the back-ring-pyramid muscles, with the result, as you see, of enlarging the chink of the glottis, which resumes its former size as soon as I allow the back-ring-pyramid muscles to relax. These movements take place during inspiration and expiration, sleeping or waking, from the first moment of our lives to the last. The back-ring-pyramid muscles have consequently the all-important function of keeping open the gate through which the air enters the lungs. They have, therefore, been poetically called "the guardians of the portal of life." I now work the side-ring-pyramid muscles, and you see that the result (in which they are assisted by the pyramid muscles) is to close the chink of the glottis, and the vocal ligaments are thus ready for the production of tone.

THE POCKET LIGAMENTS are two folds of mucous membrane, chiefly filled with glands, which run above and parallel with the vocal ligaments, which they are intended to protect. They also form a part of the resonance apparatus, but they have absolutely nothing to do with the *production* of tone.

THE POCKETS of the voice-box are two cavities, the entrances to which are formed by the spaces between the vocal ligaments and the pocket ligaments. The dimensions of the pockets vary very considerably, and they are covered with a large number of small glands. They are the means of isolating the vocal ligaments, thus enabling them to vibrate freely and without hindrance. They also serve to keep the vocal ligaments supplied with that moisture without which these could not produce tone.

A TUBE is formed above the pocket ligaments by the upper part of the pyramids and the lid, united by two folds of mucous membrane. This tube, together with the pockets just mentioned, is the first part of the resonator, the remaining parts of which are THE PHARYNX, THE CAVITIES OF THE NOSE, and THE MOUTH. These require no particular description, but I must mention—

THE SOFT PALATE. This is a movable partition, by means of which either the nose or the mouth may be completely separated from the throat. Few persons have any idea of the important part it plays in vocalisation. It is raised in the formation of all pure vowel sounds, thus shutting off the nose from the throat; and this closure is found to be *loosest* for *ah* and *tightest* for *e*; the intermediate vowels being *a*, *o*, and *oo*.

THE LARYNGOSCOPE is an instrument which enables us to watch the movements of the vocal ligaments in the production of sound. Its importance cannot be overrated, as it establishes as facts phenomena which could previously only be guessed at. We, as musicians, ought to be very proud that this wonderful little instrument is the invention of one of our number, M. Garcia. I would insist upon this very strongly, because the honour has been claimed for others, but unjustly so. No doubt experiments in the same direction, though for a different purpose, had been made in former times, but they had all failed; the utmost that was achieved by one observer being that he saw the upper rim of the lid. M. Garcia, as you know, brilliantly succeeded where all his predecessors failed, and he is, therefore, to all intents and purposes the inventor of the laryngoscope, and his name will live as long as suffering humanity is relieved by means of this instrument, which has been turned to splendid account by the medical profession.

The laryngoscope in its simplest form is nothing but a small circular mirror fixed to a piece of wire, such as I now hold in my hand. If I warm it to prevent its getting dimmed

by the moisture of the breath, and then introduce it into a person's throat, allowing the rays of the sun to fall upon it, the light will be reflected upon his vocal ligaments, the image of which is, at the same time, distinctly visible in the mirror. Now, unfortunately, the sun is not always shining when we want to make these observations, and it became necessary, therefore, if the instrument were to come into general use, to have recourse to artificial light. Professor Czermak, of Pesth, accordingly invented an apparatus similar to the one which I am exhibiting here, and with which I can not only make observations upon other people, but by means of which I can also demonstrate my own vocal ligaments in the act of singing to any one wishing to see them.

Now, looking down a person's throat, we see the vocal ligaments at the bottom of the tube which is formed by the upper parts of the pyramids, the lid, and the folds of mucous membrane uniting these parts. The vocal ligaments being pearly white, while everything else we see is of a pinkish colour, we cannot possibly mistake them, and if we ask the person operated upon to sing the vowel *a*, as in *sad*, we shall get a very perfect view of them. We plainly see their movements, and we notice that these differ according to the registers which the singer employs. In this country we are accustomed to speak of the chest, the falsetto, and the head registers. In chest voice we notice that the vocal ligaments are moved by full, loose vibrations through their entire thickness. In falsetto voice the body of the vocal ligaments remains perfectly still, the vibrations being confined to their thin inner edges. In head voice the vocal ligaments are seen to close firmly together for about one-half of their length, leaving an oval orifice in their anterior part, the inner edges of which are vibrating.

We thus see that the names *chest*, *falsetto*, and *head* are purely arbitrary; but more, they are also misleading, and they help to confuse the ideas on a subject which is most important, and on which a clear understanding is imperatively needed. I therefore propose, in accordance with physiological facts, to use the terms *thick*, *thin*, and *small* registers instead of *chest*, *falsetto*, and *head* registers. I have just explained to you the mechanisms of these registers. They are distinct and unmistakable, and I cannot understand how it is possible that some laryngoscopists have never seen them. Perhaps it is because they are medical men, who are naturally more on the look out for symptoms of disease than for physiological differences. It must also be admitted that the registers can only be properly studied upon persons who know exactly what is wanted, and who are perfectly accustomed to laryngoscopic experiments. When, for instance, a singer has not sufficient control over his tongue to keep it quiet without holding it with a pocket handkerchief, the investigation is not likely to lead to very satis-

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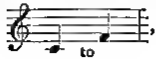
factory results, and when the toueh with the mirror eauaes any inconvenience, however slight, the result must obviously be a failure. At any rate, I am prepared to demonstrate the *thick* and the *thin* registers in my own throat, and I am sure that no one not wilfully blind will deny their existence.

So far then I do not apprehend any difficulty. But hitherto I have only spoken of the chief registers of the human voice. We know, however, that there are, besides these, subdivisions; and I will confess at once that I do not think they can be satisfactorily demonstrated with the laryngoscope. At all events the differences are so exceedingly minute as to be capable of being differently described by different observers, and I do not think, therefore, that much importance can be attached to them.

In conclusion, I wish to refer to the doctrine which is still held by some, that the female voice is simply a reproduction of the male voice an octave higher. This is clearly shown by the laryngoscope to be a mistake. Leaving subdivisions out of consideration, the male voice has but two registers, the *thick* and the *thin*, while the female voice has three registers, the *thick*, the *thin*, and the *small*. I regret that time does not permit me to go more fully into this most interesting subject, and I will bring my paper to a close with the following quotation from that eminent physiologist, Dr. Merkel, of Leipzig: "The chest register ceases, very curiously, in both sexes on one of the notes from , *so that it is about one octave longer in man than in woman.*"

DISCUSSION.

The Rev. Thos. Helmore asked if the same remarks with regard to the vocal organs would not be applicable to a boy with an unbroken voice as to a female singer.

Herr Behnke said that was so. He had had the opportunity of studying the head voice in the case of a boy in Berlin. The soprano voice of a boy was similar to that of a woman.

Madame Lind-Goldschmidt inquired what was the meaning of the breath being taken up by the "Schlüsselbein," which Herr Behnke so much objected to. She fancied that without doing so the singer would not have so much breath; at any rate, that had always been her practice.

Herr Behnke said this was a most important point. Having repeated what he had stated in the paper with regard to the

three different modes of breathing, he said it could be easily proved, by the aid of the spirometer, that by contracting the midriff you got much more air in the lungs than by elevating the top of the chest. He found that by contracting the midriff and expanding the chest sideways he could get 220 cubic inches of air, as shown by the dial of the spirometer; whilst by collar-bone breathing he got only 180. This was easily accounted for by considering the shape of the lungs.

Mr. LENNOX BROWNE desired as a physiologist to thank Herr Behnke for the great help he had rendered from the musical point of view. Until recently it was rather a reproach to singing-masters that they did not study physiology, but that had now passed away, and he must join in giving all honour to Signor Garcia, a professor of singing, for his share in the invention of the laryngoscope; and the more so since, although his experiments were only directed to voice production, and to the discovery of the mode in which musical notes were produced, the result had been to discover accurately the causes of, and so to assist in curing a number of previously obscure diseases. It would be impossible for the most distinguished physiologist to have treated this subject in a clearer manner than had been done by Herr Behnke, and he might say that the only points upon which he should differ from him were so small that they would make no difference in the teaching of a pupil. He would first beg to second most heartily Herr Behnke's remarks about respiration, although perhaps he might put it in rather a different form. The diaphragm pulled down the lungs and enlarged them in a vertical direction; the ribs did not act precisely at the same time, but followed. The first act of breathing was abdominal; then the ribs took up the action and increased it in the lateral direction. If you carried it further than that you would, by a deep, forced inspiration, and a raising of the shoulder-blades, really diminish the length of the lungs in a vertical direction and press them upwards against the windpipe, and this exaggerated respiratory effort would result in decrease of respiratory power, and consequently of the volume of the tone to be produced. It was perfectly true also, as Herr Behnke had stated, that the essential of all musical tone lay in the vocal cords. Nevertheless, it must not be supposed that all other parts of the vocal apparatus were unimportant. If that were so, why was not the *vox humana* stop of the organ a better imitation of the human voice? He could not quite agree that the ventricles of the larynx had no other purpose but to secrete mucus. Nature had placed glands all through the larynx and through the mouth, and he did not think it made the ventricle, which had the power of contraction, for nothing; nor could he quite agree that what he termed the "pocket banda" were entirely designed for the protection of the vocal cords. In his trans-

lation, to which Herr Behnke had so kindly drawn attention; he mentioned the fact that Dr. Jelenffy, of Pesth, in a case where a patient had lost the vocal cords, was able by galvanism to stimulate the false vocal cords or pocket bands, and to make them take on the action of the vocal cords, so that the patient obtained a very fair speaking voice. He thought they should be careful in changing names, and was not quite certain that these organs, formerly called the "false vocal cords," might not with advantage have retained that name, or be termed "supplemental vocal cords." However, the fact remained that between these two vocal bands there was a ventricle which could be changed in shape by the action of the muscles. It certainly had not anything to do in the primary production of musical tone, in that Mr. Browne fully agreed with the author; but it might well assist in modifying its quality. As was well known, the soft palate, by alteration of tension, greatly modified the quality of certain notes. Thus it was pressed up tightly when a high note was produced, and took quite a different position in singing a low note. Was it not possible that the soft palate did assist in alterations of *pitch* as well as of *quality?* Herr Behnke had illustrated the difference between the male and the female voice. To some extent, however, it appeared to him that the difference was due to difference of size. The vocal cords of the female were considerably shorter than those of the male, as were those of the child than those of the adult; and of course the shorter the cord the higher the note. Mr. Browne concluded with a few remarks on the relation of the different capacities of chest, and of range and quality of voice according to the height of the individual.

Mr. Steed was somewhat astonished that Herr Behnke did not attribute more importance to the false vocal cords and the pockets. His friend, Mr. Lunn, had for many years called attention to their importance in connection with vocalisation, and he was sorry his views were not more widely known. No doubt there was a difference between the right and wrong production of tone, and it was important that teachers should be able to describe to their pupils how to produce the right tone. It was most difficult to explain what went on inside the throat to pupils who were unacquainted with physiology; but the theory of Mr. Lunn, based on the observations of Dr. Wyllie, was that, in order to produce tone rightly, the ventricles of the larynx must be fully inflated in the first instance, and that this was to be accomplished by catching the breath. Consonants were generally looked upon as simply obstructions to sound. If you closed your lips firmly and blew against them, the more strongly you blew the more they would not open—the breath would not part them; but when you let them open there was an explosion, and the

sound of *p* was produced. If the tip of the tongue were put against the palate you also produced an explosive, the sound of *t*, and farther back the *k* sound. If the obstruction were put still farther back, the lips of the false vocal cords were forced to meet in the throat and cut off the possibility of breath coming through. The ventricles then became fully inflated, the larynx rose in the throat, and upon allowing a small amount of breath to escape you produced the slight sound generally called the shock of the glottis, which was conducive to the force, purity, and clearness of the succeeding vocal tone. Since he had become acquainted with this matter he found his teaching very much simplified, for whereas before he found it very difficult to make pupils understand the way in which to produce a satisfactory tone, since he had known this he had had no difficulty, except one of time, in obtaining from all candidates a tolerably good tone. He did not believe that all were endowed with good voices, but he did believe that all had improvable voices if only the tone were produced rightly, and that, if the right method were followed, there would be a considerable accession to the number of good amateur singers. He had a communication showing that 1750 years ago a very distinguished physiologist, Galen, was nearly as well acquainted with the action of these ventricles as Dr. Wyllie himself, as was shown in an article in the *Orchestra* for the present month, by Mr. Lunn, in which he quoted a translation from Galen by Mr. Gordon Holmes. After quoting from the above article, Mr. Steed contended that on this matter hinged the rising of the larynx in the throat and the forward production of voice. Madame Sefler attributed it to the position in which the vowels were formed in the mouth, but he considered it depended mainly on the rising of the larynx in the throat consequent upon inflation of the ventricles. When the larynx rose the ring cartilage rose more quickly than the thyroid cartilage, thus causing the vocal ligaments to assume a somewhat slanting position in the throat, and by that means was attained a more forward production of what he called the raw material of sound. Generally speaking, in training voices this raw material was not sufficiently considered; but he thought it was a mistake to teach the enunciation of consonants and speech sounds before the raw material of the voice was properly developed. He thought physiologists and musicians should give greater attention to the action of these ventricles in voice production, and should experiment upon themselves to see whether, by careful attention to producing the voice in the way he had indicated, a purer, clearer, and more sustainable sound did not result.

Mrs. Egerton Brownlow, as a pupil of Signor Garcia, said that teacher was very particular in making his pupils breathe in the manner called the midriff and rib breathing. He also

laid great stress on the shape of the pharynx in the production of sound.

The CHAIRMAN said he did not think either Herr Behnke or Mr. Lennox Browne was quite correct in all they had stated on the matter of breathing. He knew from experience that many women could not breathe in precisely the same way as men. The latter could undoubtedly sing without clavicular breathing at all, and those who used that method committed a great fault; but he was quite certain that with the female voice it was not possible, or at any rate he had not met with a case of a lady who could sing properly simply breathing from the midriff, but she was also obliged to use the clavicular breathing. It certainly should be done in such a way that the observer saw as little of it as possible, but experience convinced him it was impossible for a female to take a full breath without clavicular breathing. At the same time the other breathing went on simultaneously. In fact good singers used the three methods together, and by that means they were able to produce long-sustained sounds, and to make the splendid phrasing which some of them attained. Mr. Steed had remarked that pupils were sometimes taught to sing with words, and thereby the chance of cultivating their voices properly was lost; but it was an old theory amongst good musicians that voice tone was one thing and enunciation another, and that the two things should be taught separately. The question of the falsetto, the head falsetto, and the mixed voice was not yet understood, he believed. The falsetto in women was one kind of voice and that known to cathedral men another altogether. He himself had a chest voice, a mixed voice (which he believed Herr Behnke had accurately described as a falsetto), and he also could, if he pleased, sing in a purely falsetto voice, and he did not think it had yet been shown how that was accomplished. In conclusion, he begged to propose a cordial vote of thanks to Herr Behnke for his valuable paper.

Mr. LENNOX BROWNE said he did not differ at all with the Chairman about breathing, nor he thought did the author of the paper. The clavicular breathing was an extension, and to his view, despite what Madame Goldschmidt had said, *an unnecessary extension* of the other two forms. He quite agreed that a woman must breathe more with the upper part of the chest than a man, but in no case should the respiratory act be carried to the extent of raising the collar-bone. If the pupil would sit with her arms over the back of the chair the collar-bone could not move, and it would still be found that a full and steady tone could be produced. Clavicular breathing was at the root of almost all vices of voice production, especially of the *tremolo* and *vibrato*, so common to pupils of certain schools.

The vote of thanks having been carried unanimously,

Herr BEHNKE said it would be impossible for him to reply to all the observations which had been made, many of which touched points which he had not mentioned in the paper, and if he were to go into them it would take him too long. He had not started any theories, but only told them what he had seen and what he could prove. With regard to Mr. Lunn's theory, as mentioned by Mr. Steed, he disagreed with it *in toto*. Mr. Lunn maintained distinctly that the female voice was nothing but a reproduction of the male an octave higher. That was not true, and he should dispute it to the last. He was now engaged upon a book on the subject for a London firm,* and in that book he proposed to deal with Mr. Lunn's statements, and he hoped he should succeed in entirely confuting them.

* Since published—"The Mechanism of the Human Voice." London: John Curwen and Sons.

December 1, 1879.

W. H. MONK, Esq.,

In the Chair.

ON A MODE OF PRODUCING CONTINUOUS NOTES FROM RESONATORS.

By R. H. M. Bosanquet, Esq.

Those who were present at the reading of Mr. Spottiswoode's paper, "*On* Beats and Combination Tones," last session, may remember an observation made in the course of the discussion to the effect that the excellence of the apparatus employed goes for a great deal in acoustical investigations. I have to bring before you to-day an attempt to obtain efficient apparatus, somewhat less costly in its construction than that exhibited to you by Mr. Spottiswoode.

The great step which is the foundation of the modern analysis of musical sounds was made by Ohm. Helmholtz says:* "Ohm was the first to declare that there is only one form of vibration which will give rise to no harmonic upper partial tones, and will, therefore, consist solely of the prime tone." Without now entering on the question whether absolutely pure prime tones can exist in nature, we can well understand that the property which defines the pitch of a note may be supposed to exist in its most definite form, and entirely free from the admixture of other notes. These pure primes, whether realisable or only ideal, are the elements by the combination of which all the composite notes of nature are formed; and, as all analysis depends on our knowledge of the elements whose presence we have to ascertain, the study of the properties of these pure prime tones is, in one sense at least, the foundation of all acoustics.

* Ellis's "Helmholtz," p. 34.

The first step towards the study of pure prime tones is to produce them either pure or as pure as may be. The apparatus I employ to produce a pure prime tone consists of a bottle blown by the mouth of an organ pipe. The sole originality to which I can lay claim is the practical arrangement of the combination. For it is matter of common knowledge that the note produced hy a properly blown bottle is an approximately pure prime tone. The notea used by those experimenters who bave employed bottles were generally produced in this simple way. I take one end of this tube in my hand, the other end being attached to the bellows, and hold it in a particular way over the mouth of this bottle. A note of pure quality is produced. Now, if the end of a tube were firmly fixed in this position it would make a very good arrangement for the purpose; and I believe some experimenters succeed in fixing the tubes in this way. I have not found this processa advantageous. It is necessary for convenience that the arrangement adopted should possess some stability—should atand a certain amount of knocking about—but the slightest derangement of the tube prevents it from speaking. Again, it is desirable that we should have the means of tuning the bottle or resonator employed, as well as means of connecting its interior with the ear, when used to search after sounds. All this is met by the construction I have adopted. I hold in my hand the first instrument that I made in this way. I made it as a curiosity long ago. It gives a very fair note. It is simply the foot of an organ pipe slipped into a bottle. I now make them like this one which I hand round. (See woodcut at the end of this paper.) The bottles ought to be an inch and a half or two inches, at least, across the mouth, so as to receive a cork or bung large enough for the purpose. The largest bottles that can be got do very well for bass notes. For notes about middle C, and higher, I find a kind of bottle called honey jars convenient. They have wide mouths in proportion to their size. Three holes are to be made through the cork—a large one and two small ones. The large one is to receive the portion of the organ pipe by which the bottle is sounded. The two smaller ones receive two small glass tubes. One of these can be used to communicate with the ear by means of the apparatua I have devised for the purpose. The other reaches to the bottom of the bottle, and is used for introducing water or removing it, for the purpose of altering the pitch. The glass tubes are of about one-eighth of an inch diameter. They are bent over at right angles just above the cork, so that india-rubber tubes may be conveniently attached to them.

The organ pipes made use of are generally old metal pipes of the octave between two feet and one foot. The metal must be pretty soft, so as to stand the shaping without injury. The diameter used may vary from about an inch and a half

nearly down to half an inch. For notes about middle C, I find one inch to three-quarter inch diameter convenient. The cylindrical part of the pipe is cut across, three or four inches from the mouth. The part employed is the foot, with what remains attached to it. The cut end of this is smoothed off and fitted into the cork. The mouth is then cut up considerably. A rough rule is to make the height of the mouth equal to its width. This height may sometimes even be exceeded with advantage. The upper lip of the pipe on which the wind strikes is slightly curved outward, with a burnisher or the round edge of a screw-driver, so that the wind strikes a rounded surface, and not a sharp edge. The bottle-pipe is then voiced; it will often take more wind than the pipe did before, both at the windway and at the foot. The glass tubes can be bent in the flame of a common lamp; a gas flame is convenient for the purpose. It is necessary to heat the ends where the tube has been cut with the file; as otherwise the sharp edges are liable to cut and tear the corks and tubing. The resonator can be made sharper in pitch by introducing water into it through the tube provided for the purpose. It can be tuned in this way to any note higher than the note it sounds when empty. The mouth-piece generally has a moderate range throughout which it speaks best, and a more extensive range throughout which it speaks somewhat less well.

Applying the ordinary theory of the harmonics of organ pipes, the tone should be entirely free from harmonics, as it cannot form them either in the manner of open or stopped organ pipes. The tone is really very pure if the instrument is well arranged; but I have not found it in any case absolutely free from harmonics, any more than I have found any other so-called pure tones to be free from them. In some cases the traces of harmonics have been so small as only to be detected with difficulty; but in other cases a note has been obtained in which the twelfth or tierce is remarkably prominent. This is curious, as it shows that these harmonics can arise where there can be no application of the theory of stopped pipes, which has hitherto been supposed to be the only way of accounting for their production. I now sound a deep note of very pure quality.

The first experiment I shall endeavour to show you is one in which I will ask your co-operation. It is to illustrate the way in which a continuous pure tone forms in a closed space a series of what may be called foci of sound, separated by intervals where the sound is less heard, or not heard at all. In the language of acoustics, we may say that the space is occupied by stationary nodes and loops. Now I will again sound the six-foot F; and I will ask those of you who hear the note to hold up your hands, or give some indication that you hear it well. I must observe that the foci formed under these

circumstances are sometimes small; and it may happen that there is only a single person within hearing of such a focus. So I must depend upon you all to give some indication if you do hear the note.*

These effects are the more marked the greater the resonance of a room is. We have here one of the elements in the explanation of the fact that low notes are so particularly unmanageable in buildings possessing great resonance. A note having a wave length of twelve feet may, if of pure quality, be almost inaudible throughout a great part of a room, such as we meet in; the points or foci at which it is concentrated occupying altogether an inconsiderable space.

It is possible, by making use of the fact I have just brought before you, to get some notion of the composition of any given note. The harmonics generally have some foci in those portions of the room where the fundamental is silent or nearly so; and by listening at these points, harmonics can often be detected without further analysis. It is possible that some of you may have already detected the harmonics in these notes by this means. The use of this method generally requires more perfect silence than can be obtained in a meeting; but it is on the whole an efficient method. The complications introduced by resonators are avoided, and the ear feels more confidence in the result, as it is heard more directly. For a thorough investigation, however, both methods ought to be combined.

I will now show you a contrivance I have had constructed, which is of great use in the employment of resonators for the detection of the elements of compound sounds. The instrument you see† consists of a bent copper tube, with two ear-pieces like those of an ear trumpet. These pieces can be brought opposite the two ears, the connecting tube passing under the chin. The ear-pieces are then turned round by the finger and thumb, and they advance along screws until they enter the passages of the ears. I find it convenient to cover the ivory ear-pieces with a double thickness of small india-rubber tubing, which assists in closing the ear passages to external sounds. External sounds cannot be entirely stopped out by any mode of closing the ears, but the use of this tube stops them out as effectually as anything. The copper tube can then be placed in communication with an india-rubber tube connected with the resonator or any source of sound. You can understand that this instrument, when connected with the interior of a

* The sound appeared to be universally heard. It was not possible in a moment to get the audience to distinguish between places where it was loud and soft. But later it was fully realised by several that even small movements of the head of the listener produced considerable differences in the sound heard.

† The instrument was made by Mr. Walters, of Moorgate Street.

resonator, is a test of considerable delicacy for the presence of the note to which that resonator would resound.

The simplest use to which this arrangement can be put is the examination of notes, as to the presence or absence of the various partial tones in them. Suppose, for instance, I want to ascertain if there is any octave in my low F: I should place the octave resonator in communication with the ear, and listen. This kind of examination is one of the most difficult of these problems; and it requires considerable practice and care to make sure of the result in some cases. If there is any octave at all in this note (low F), it is very little indeed. Sometimes I have succeeded in perceiving it; sometimes I have failed to do so. The twelfth, on the other hand, can be heard distinctly with the unaided ear.

It is necessary to notice that what is to be listened for with the resonator is the note in question sounding continuously. Every shock in the apparatus, every noise in the room, gives rise to a development of the note of the resonator, which dies away again immediately. It is only in the absence of such shocks and noises that the presence or absence of the continuous note sought for can be ascertained with accuracy. I find it advantageous to hold the tube between my fingers, and open and close it alternately. The true nature of what comes to the ear through the tube is more distinctly ascertained when compared with the intervals of silence.

This apparatus is also employed for the purpose of investigating the nature of beats; and it was mainly with this object that it was devised. The principle that we admit as the foundation of the theory of beats is that all beats consist of variations of intensity of musical notes.* The various objections that can be brought against our views frequently involve the assumption that beats exist which are not to be referred to this cause. The views of König, as well as those based on the work of Robert Smith, who may be called the founder of the old school of acoustics, all involve the supposition that beats exist which are to be referred to causes different from the variation of notes. We have, therefore, to analyse experimentally the cases in which beats of this kind have been supposed to arise; to examine all the notes present, to see whether it is really true that beats ever arise in cases in which no note varies in intensity.

I will take the case of the fifth, as one of the simplest. When it is slightly out of tune, beats are heard. We have to examine the various notes present to find out what variations in intensity take place. Say that we take the fifth *f*—*c'*. We first examine the separate notes, and find that they both contain octave and twelfth in small but appreciable quantity.

* There is generally a variation of pitch as well.

We then form the combination, and listening with the resonators to the single notes one after another, we should find (1) the two fundamental notes are perfectly steady, and unaffected by any wavering; (2) the note c'', which is the octave of c' and twelfth of f, varies in intensity or produces a beat.

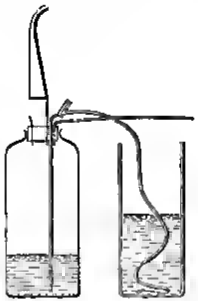
I have here the apparatus arranged for this last demonstration; but I cannot well show it you convincingly, as it depends on what I hear through the instrument. Moreover, these are fundamental experiments in no way new in principle. The apparatus is what I have to show you.

I will now mention the analysis of the beats of the octave slightly out of tune. This is most easily performed by utilising the foci and places of silence formed by the lower note. When the notes are sounding, and one moves about the room, passing between the foci and places of the silence of the lower note, one notices immediately that the beats accompany the lower note. They are heard most strongly in its foci; and if a place can be found where the lower note alone does not sound at all, the beats are not heard there. If I now sound the notes of the imperfect octave in this way you may possibly be able to verify this partially; but it can hardly be done satisfactorily without moving about in the room. There is also a beat of the upper note; but where, as in this case, the lower note contains little octave, this beat is of small intensity. In fact it is as difficult to hear as the octave in the low note.

Another experiment which I have here is an arrangement for listening for a difference tone through a resonator of its own pitch. The two notes f' a' produce F strongly as a difference tone. A resonator tuned to F is attached to the ear-pieces. The effect is always, so far as I know, to extinguish the difference tone. It appears incapable of being heard through a resonator. We notice incidentally that the other combination tone c', which has occasionally been noticed but not satisfactorily explained, is present in considerable intensity. If I now allow water to flow out of the resonator a', it approaches f'; the lower combination tone falls gradually, and the upper one rises. This is one of the best modes of calling attention to the combination tones. The listening resonators are sometimes made, as you see, distinct from the sounding ones. A cork with a hole bored in it converts a bottle into a simple resonator very conveniently. To depress the pitch, a bit of the cylindrical part of an organ pipe may be inserted. The glass tubes as before. The wind is distributed to its various destinations by means of this small wind distributor—a miniature organ wind-chest with twelve slides, which admit the air to pipe feet, on which flexible tubes are fitted.

I have attempted to place before you an easily accessible form of apparatus for performing some of the fundamental

experiments of acoustics, in the hope that some may be induced to construct similar forms of apparatus for themselves, and that the knowledge of this part of the subject may come to be founded on actual experience to a greater extent than is now generally the case.



Section of speaking resonator, with organ-pipe mouth-piece, siphon with stop, and reservoir for tuning; also flexible tube for putting into the ear when used as an analysing resonator. This tube can be also used for gas-flame experiments

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SOME EXPERIMENTS WITH A REVOLVING STOP-COCK.

By R. H. M. Bosanquet, Esq.

In certain treatises on acoustics we find a stop-cock mentioned, which could be opened and closed with great rapidity. This instrument is said to have been constructed by Professor Robison. In the article on "Sound" in the "Encyclopædia Metropolitana," Sir J. Herschel mentions this instrument, and conjectures that its action must have been obtained by causing it to revolve. Several problems suggested themselves to me which might be dealt with by means of such an instrument. I caused this one to be constructed, and can recommend it, not only for the purposes of the problems in question, but also as a simple mode of demonstrating roughly some of the elementary phenomena of sound which generally require the siren, a much more costly machine.

A long, narrow iron plate is attached to a heavy block of wood, and forms a firm foundation for the instrument. This consists of two parts—a wooden wheel, twenty inches in

diameter, having a groove cut all round the edge to carry the cord; and the stop-cock itself, which has a small metal wheel at right angles to its axis, similarly grooved round the edge. The diameter of the metal wheel is one inch, so that one revolution of the wooden wheel corresponds to twenty turns of the stop-cock. The tube in which the stop-cock is inserted is at right angles to the line of centres; it is about two inches long from end to end. Half an inch at each end is covered outside with a shallow screwed surface, fit for entering into the tubes between which the stop-cock is to be interposed, and forming tight joints. The cord is a piece of gut, joined with a metal hook and eye, in the manner practised for the purposes of the turning lathe. I have also driven the machine satisfactorily with a piece of thin string tied at the ends.

I have two stop-cocks, which are used for somewhat different purposes. They can be interchanged at pleasure. The one has rather a small bore, and is pierced by two channels at right angles. The other has a much larger bore, and has only the one channel. The two-channelled stop-cock opens and closes the tube four times in each revolution; the one-channelled stop-cock opens and closes the tube twice in each revolution.

The first thing we can show by this means is the production of a note by forcing air through the stop-cock as it revolves. With this primitive apparatus it is difficult to secure any great speed, and middle C is about the limit of what we can arrive at with the two-channelled stop-cock, tenor C with the other.

The note is not very perfect. If, however, I cause the issuing jets of air to enter a resonator, I get some remarkable effects, when the jets have velocities which correspond in certain ways with the pitch of the resonator. I connect the stop-cock, by means of a piece of tubing, with this bottle, which now resounds to a note not far from tenor C. A greater volume of tone is produced by the large bore stop-cock, which will now be placed on the apparatus. As we begin to turn the machine, while the velocity is yet low, there are one or more points at which a great volume of tone is produced. It is difficult to turn the machine by hand uniformly enough to produce these effects with great clearness. But their presence is easily demonstrated. As we increase the speed there is no further development of tone until we reach the neighbourhood of the note of the resonator, when the tone begins to swell out. Ultimately, when we reach the note of the resonator, a tone of surprising volume is produced. The explanation of the resonance to the low note appears to be this: when the speed of revolution is such that the resonator is one of the overtones of the note due to the jets, that overtone is selected from the mass, and strongly reinforced. It must be remembered that the effect of a series of discontinuous jets of air is

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to construct a sound in which theoretically the partial tones are all of the same strength, the fundamental included, so there is plenty of overtone for the resonator to take hold of. At the same time, there is still a certain amount of the fundamental pervading the whole machine; and this appears to combine with the overtone in the resonator, and produce the peculiar sensation of depth which exists in the sound in question. As to the excitation of the resonator by the jets, which constitute a note of its own pitch, it is a simple illustration of well-known principles. I have sought to use this arrangement for the purpose of obtaining some information as to the mechanical equivalents of sounds of different degrees of loudness. It is easy to see that the mechanical work of the bellows is here transformed into sound in an advantageous manner. If then we measure the work on the one side and the sound on the other, we may expect results which may be at all events not without value as bearing on the question. The execution of this project requires special apparatus for securing uniformity of motion in the machine, and other things which have not yet been carried out. But I may briefly lay before you, as specially a problem for musicians, the question of the measurement of the loudness of sounds, or the reduction of the estimation of loudness to definite measure. We have marks of loudness from *fff* to *ppp*. Let us arrange these in order, and form out of them a scale of loudness proceeding by uniform differences of sensation. We may further extend the scale to sounds louder and softer, respectively, than sounds practically used in music.

Scale of Audible Sounds.

Not used in music.	*fffff*	1.	Steam whistles. Noises that cause pain.
Marks of loudness used in music.	*ffff*	2.	
	fff	3.	
	ff	4.	Public speaking at the top of the voice.
	f	5.	Ordinary public speaking.
	mf	6.	Loud ordinary conversation.
	mp	7.	Ordinary speech.
	p	8.	Soft speech.
	pp	9.	Strong whisper.
Not used in music.	*ppp*	10.	Faintest whisper. "Microscopic" sounds.
	pppp		

To the sound magnitudes corresponding to sounds used in music, I add one above for sounds louder than any that would be used in music, and one below for sounds fainter than any that would be used in music. That these latter sounds exist and are of importance you will understand if you remember

what you were told here on a former occasion, that a well-known investigator had to go away into the country and, when there, work at midnight, in order that there might be such silence around him as not to interfere with his results. The scale of sound magnitudes thus established is in many respects comparable to the scale according to which the magnitudes of stars are estimated. It is based on the estimation of different degrees of loudness, according to the experience of practical persons. This being so, a series of interesting deductions is at our disposal; but they are mostly of a theoretical nature, and I will only trouble you with practical points.

Suppose I form a note by means of the apparatus I described, or by means of a resonator, I require first to estimate its loudness, its position in the scale. I found this at first very difficult. The comparison of unmusical noises is a great assistance. Compare the sound, for instance, with conversation. I will assume that we find it of the fifth magnitude, or *mf*. Suppose, then, I measure accurately the work done by the bellows in every second of time. Then, with certain reservations and allowances, we may say the measured amount of work per second is the mechanical equivalent of a fifth magnitude sound having the pitch of the note produced, in a certain room and under certain conditions.

The other experiment, to which I have to invite your attention, is that for which I originally constructed the revolving stop-cock. If I interpose the stop-cock in the supply of wind to an organ pipe or resonator, and cause it to revolve, in some cases the pipe or resonator will still sound. The sound thus produced is sometimes continuous and sometimes intermittent, as the velocity of rotation changes. Whenever the sound is continuous, we know that the vibration goes on in the pipe long enough after the supply is cut off to bridge over the gaps in the supply caused by the stop-cock. When the sound is intermittent, we know that the vibration does not go on in the pipe long enough after the supply is cut off to bridge over the gaps in the supply. If the pipe or resonator does not speak at all we learn nothing.

I have not succeeded in making any open pipe speak satisfactorily under these circumstances. Why this is I do not know. But resonators and stopped pipes can be found which speak very readily, and offer a series of remarkable phenomena, according as the pressure of the wind employed, the speed of the stop-cock, and the other circumstances are varied. I will try to show you some of the principal phenomena; but they cannot be measured in an accurate manner without some means of turning the stop-cock at regulated speed.

The first effect is generally rough intermittent sound, which disappears suddenly when the stop-cock attains a certain speed.

When there is a full pressure of wind, the continuous tone appears at a certain definite point, and continues thence unchanged up to the highest velocity attainable. This point of first appearance of continuous tone furnishes the datum I am in search of. If, however, a less pressure of wind is employed, a series of curious phenomena occur, which I see, at least partly, the explanation of, but cannot go into in detail on this occasion. With certain velocities the pipe speaks more or less clearly; and these are generally separated by others for which the pipe is more or less completely dumb. It is easy to see, generally, that when the survival from one impulse into the next just begins to be felt, the pipe will speak most readily when the period of the impulses is an integral number (say four or five) of the vibrations of the pipe. This is the case where the pipe sounds for an isolated velocity. When, on the other hand, the survival is completely established, the impulses are all taken up and properly directed by the continuous vibration set up in the pipe. In this case the pipe sounds its note uninterruptedly through a considerable range of velocity. No doubt a better form may be given to the instrument; it may be improved in many ways. But I do not think it is likely that these questions will be attacked by means of a simpler or more accessible arrangement than the one I have brought before you to-day.

DISCUSSION.

Mr. CHAPPELL said he had a few words to say on some of the definitions, such as *sub-harmonics*, which he did not recognise under that name.

Mr. BOSANQUET said he only adopted that as a convenient description.

Mr. CHAPPELL said there seemed to be a considerable difference of opinion as to what harmonics were. He had had considerable practice in them for many years in connection with strings, and he knew that they invariably went in one order, if they were true harmonics arising from the string. Other sounds might be caused by the vibrations of a lock or hinge. The string divided itself into aliquot parts successively, the half, third, fourth, fifth, and sixth parts being well known consonances. He had seen as well as heard in very old pianofortes a string divide itself first into half, beginning from the place where it was struck, and then into three, four, five, six, seven, eight, and even nine parts. The seventh was always distinctly audible because it was an unusual sound, not being admitted in our musical scale. The word "harmonics" had been applied in another sense, to sounds which might be

produced by the air after it bad passed through a musical instrument, and then raised sounds from other objects in the room by its waves. The definition of a true scale is the sound of a whole string or pipe and of its aliquot parts. He had produced, with Wheatstone's resonating tube, 3½ octaves of true notes in that room, from the vibrations of one note. As the piston was moved up it diminished the size of the resonator, and thus raised the pitch of the note. He did not think, although it might be ruled so, that the true harmonics should be included with the secondary sounds created by other objects in a room. He would also remark that what are called Tartini's low notes are differently stated by different persons, as for instance by Tartini himself, by Dr. Crotch, and by Helmholtz. He had at last traced the cause of their various accounts, with the assistance of Professor Macfarren and of Dr. W. H. Stone. We may obtain from these low sounds all the notes they have named. The notes change very rapidly, and it is often difficult to catch the first feeble tone, which is the real root. It may indeed be below the pitch of the instrument upon which the experiment is tried. His object in these experiments was to test whether these sounds resulted from the coincident vibrations of the two upper notes, or were only "difference tones," as suggested by Helmholtz. He had ascertained that they were consonance tones, and that Helmholtz's term of "difference tones" was a mistake. The proof was obtained by trying the major and minor sixths. With regard to sounds which had received new names, such as "combination tones, partials, upper partials, lower upper partials, single, secondary," and so on, the names were new but the sounds were not. The supposed differences are imaginary, for all are harmonics of the fundamental note. Helmholtz's Resonators are musical instruments made to sound only one note, according to their size and capacity, while Wheatstone's Resonating Tube proves that all harmonics may be sounded from the one set of vibrations of the lowest note of the scale. Harmonics are multiples of the vibrations of the fundamental note. Thus, if the lowest *c* have 32 vibrations in a second of time, its octave will have 64, its twelfth 96, and its double octave 128 in a second. As to beats, they were caused by slight differences of pitch between two strings or pipes, and they disappeared when the string or pipe was in tune. These were very different from ordinary vibrations, for the former occurred but once in a cycle of vibrations and could easily be counted: therefore they were a guide to the tuner instead of an impediment. The vibrations themselves had often great power. Every lady who had a grand pianoforte knew that if one of her guests placed a tea-cup and saucer down upon it, the vibrations were so great as to raise the heavy lid of the pianoforte into vibration, and make the tea-cup

and saucer rattle. This would illustrate the power of musical vibrations in a room. It had been lately argued that all musical tones were compound. True that they are caused by numerous vibrations, but these only give continuance to the audible note. No other notes are audible with it, and the ears are the sole judges. Inferences drawn from resonators against the evidence of the ears are delusive, because the resonators are only set into vibration after the sound has issued from the instrument and arrives to them.

Mr. A. J. Ellis, F.R.S., said with regard to several points which had recently been mentioned, some of his own experiments upon beats, which were still going on, confirmed a great deal of what Mr. Bosanquet had said. He had been obliged to make thousands of observations with Appunn's instrument, in order to discover what was the error and what was the cause of it; and in doing so he had been beating the reed tones of one instrument with the reed tones of another, without using any resonators; and he then got those peculiar effects which Mr. Bosanquet had mentioned, and the disappearance of the beats in certain positions. It seemed as if the ear was suddenly struck deaf, for by moving the head a little you heard nothing, whilst moving it into another position you heard the beats perfectly well. The beats he had taken with the harmonium reeds, one against the other, had been those which arose from fifths, sixths, sevenths, and eighths, up to elevenths, thirteenths, and even sixteenths, and they always followed the rule which was obtained from the simple calculation of partial tones?

Mr. Chappell asked what he meant by partial tones?

Mr. Ellis said he meant *Theil-töne* or *Partial-tone*, which were explained in Helmholtz's book; and as a translation of that book was before the public there was no necessity for defining them further. He was using the word now merely to show that they followed the laws which Helmholtz laid down as being those of the partial tones. They had been more strongly marked in an experiment which he had been lately making upon comparisons of the reed tones with the tones of tuning-forks. He took a tuning-fork and held it over a resonance jar which corresponded to its fundamental tone, which made it simpler and brought it out clearly and distinctly. He then sounded the reed tones, and had been able to get countable beats with what, according to Helmholtz, would be called the twentieth partial, by which he was able to determine the pitch of that reed tone. Lately he had only been taking the sixth, seventh, and eighth partials, but he had gone much further. The beats were perfectly clear and distinct, and you heard the lower partials, according to Helmholtz's nomenclature—at any rate, lower tones—going on perfectly undisturbed; and thus, by means of the

tuning-fork, without any resonance box which would alter its shape continuously, you might pick out of the middle of these compound tones the one which was nearly in pitch with the tuning-fork, and with that it would beat. So much did it answer to its helm, that he could draw up beforehand a list of the tones. He was just then trying the eight-feet octave, and he calculated five, six, seven, and eight times the pitch of the reed, and that told him what fork he had to take in order to get the beats with the fifth, sixth, seventh, or eighth partial. They came out as clearly and distinctly according to expectation as could be conceived. There was nothing like the tones being generated by any apparatus. In Appunn's instrument you were able to produce a loud continuous reed tone for any length of time without any sensible alteration, and from that long tone he could pick out any partial he pleased by means of beats and beats only, not by means of resonance. There could not be a much better illustration of the objective existence in the original reed tone of tones of the same pitch, or nearly so, as the forks he was using. He was using Scheibler's forks—not the original set, which had unfortunately been lost, but the second set made by Scheibler himself. With regard to the so-called combinational tones, the difference or summational tones, or however the summational tones might have arisen from the sum of two difference tones, according to the theory of Appunn and Dr. Preyer, he mentioned in giving an account of Dr. Preyer's paper before, that Dr. Preyer considered he had perfectly established that these difference tones were entirely subjective, as he could not by them produce any objective phenomenon whatever. That agreed pretty well with what Mr. Bosanquet had said, although he did not yet see perfectly and clearly whether they were subjective or objective. He was much pleased at seeing a method of producing simply and easily these continuous tones, but the simple tone thus produced in the bottle itself was a kind of woolly tone, not a bright clear tone like those produced from a tuning-fork. From the tuning-fork he had not succeeded in producing tones so as to count beats with anything higher than the twelfth; the octave he was constantly using, but there was a difficulty in regulating the comparative loudness of the two tones you wanted to beat together. He was unable to get any beats with the octave of Scheibler's forks from the higher parts of Appunn's tonometer. The reed tone entirely overbore it, and he should have to go 100 feet off in order to reduce the value of that tone and bring the fork close to his ear before he could hear the beats: even with two tuning-forks, held over the same resonating jar, he had found constantly that it did not do to hold them at the same distance from the top of the jar, but the stronger fork must be held further off, otherwise the beats became blurred and indistinct; but when

the louder fork was held a little distance off, you would generally get the notes out as clear and distinct as possible. He had forgotten to mention, when speaking of two-reed tones, that if you took beats of the fifth, beating four in a second, the tone you heard was a bright, bell-like, simple tone, and at the same time there was a kind of surge of other tones below and above; but it picked itself out with perfect clearness and distinctness, having the property of the simple tone. He should have to give a fuller account of his experiments at another time and place, and he only mentioned them now because it seemed to point out clearly that these things, which were called partial tones, quite fulfilled the functions of simple tones.

The Rev. THOS. HELMORE said he was not very conversant with all these wonderful experiments, but was much interested in sound. He thought the Society was very much indebted to Mr. Bosanquet for his interesting paper and for the experiments he had shown, which to him were very interesting, as he had not had the opportunity of seeing many such. He had the opportunity some time ago, when Dr. Donaldson was here, of seeing his apparatus, and from that he could confirm what Mr. Chappell had said, that when a long wire was put into motion by a double-bass bow, the nodal points and divisions were as clear as possible. All the works of God were very wonderful and gave scope for endless investigation. They all knew that the phenomena of light and sound had great affinity to one another, and that our ears were affected by sound and our eyes by light by means of motion. When you got either a column of air in a pipe or a wire in vibration, it vibrated first in its totality, and then you had what was called a pure sound. All the other sounds would, he supposed, arise from certain divisions of the vibration, as the propelling power which set the vibrating body in motion became weaker.

The HON. SECRETARY asked if Mr. Bosanquet could explain how it was that these comparatively small bottles produced such exceedingly grave sounds. Was the bottle to be regarded as following the laws of a stopped organ pipe?

Mr. BOSANQUET said the theory of resonators of that class was, he believed, now pretty well understood. Helmholtz had done a great deal towards clearing it up. The standard paper on the subject was one by Lord Rayleigh in the "Philosophical Transactions." The pitch depended on the ratio between the orifice and the contents of the vessel. Having a neck to it made some difference, but by taking vessels which had a small orifice you would get very deep notes indeed. After a certain time the orifice became too small to take up the vibrations in the external air at all, and at that point it ceased to be of use; but there was no difficulty at all in getting a resonator of any size to any pitch. You

had only to vary the proportion between the orifice and contents of the resonator, and you might get a resonator of the size of a thumb-nail sounding to a thirty-two feet pipe.

Mr. Willis said he understood Mr. Bosanquet to say, in one part of his paper, that a sound could exist without vibrations.

Mr. Bosanquet said that must be a mistake.

Mr. Willis said he considered each of these bottles as a veritable stopped diapason; it was nothing in the world else. If you took a soda-water bottle and blew into it, a very deep sound was produced, and every one felt astonished the first time that so small an article should produce such a grave sound. It was simply due to the smallness of the orifice and the largeness of the bulk. Sir Frederick Ouseley, many years ago, thought he had made a great discovery, and invented a stop which was pyramidal, being much larger at the top than at the bottom. With a very small box he undertook to produce a thirty-two feet tone. He never heard that tone himself, but it certainly was done on that same principle.

Mr. Bosanquet said there was nothing at all new in the fact of using these resonators; in fact, he did not intend to bring forward anything in the nature of theory at all, but simply to show a practical adaptation of well-known things to the performance of certain experiments, in which many were interested and which were not generally known, because the instruments were complicated and expensive. The apparatus he had shown them was very simple, and any one could easily make it themselves at a small expenditure, and go through a great number of the experiments of Helmholtz; and it was only in that way that a sound knowledge of the subject could be diffused.

The Chairman proposed that the very best thanks of the Society be given to Mr. Bosanquet for his able paper, and for the great trouble he had taken to illustrate it. It must be understood that all the novelty consisted in the little apparatus he had been good enough to bring down. The theories referred to had been discussed elsewhere, and one might almost say were the subject of daily re-discussion and addition. Mr. Ellis was even now experimenting continuously upon the same musical natural phenomena, and they were very much indebted to Mr. Bosanquet for his kindness in explaining a simple method of procedure which would enable almost any one to conduct the same experiments.

The vote of thanks was carried unanimously, and a similar compliment to the Chairman terminated the proceedings.

JANUARY 5, 1880.

JOHN STAINER, ESQ., M.A., MUS. DOC.,

VICE-PRESIDENT, IN THE CHAIR.

ON BEAUTY OF TOUCH AND TONE: AN INQUIRY INTO THE PHYSIOLOGICAL AND MECHANICAL PRINCIPLES INVOLVED IN THEIR CULTIVATION.

By A. ORLANDO STEED, Esq.

PART I.—THE VOICE.

THE subject of this paper, "Beauty of Touch and Tone," is one which however admirably it may be exemplified in the public performances of many—unhappily not all—of our leading artists, however conscientiously it may be inculcated by our most eminent teachers, is, in the playing and singing of too many of our amateurs, conspicuous only by its absence; and I can but think that, from the generality of the members of the musical profession, it does not receive that amount of attention which its importance demands, and which the rapid extension of musical education in some other directions might lead us to expect. That during the past few years a real improvement has taken place in the attainments of both professors and amateurs is plainly evident, general culture and musical culture going hand in hand. The literary world is leavened by musical thought, and in the musical world the *mere musician* bids fair in a very short time to become as extinct as the dodo. In theoretical knowledge, in the power of rightly appreciating the true purport of classical works, in reverence for their authors, in the facility with which he sings or plays difficult pieces at sight, in dexterity of manipulation, the musician of average ability is far, far in advance of his immediate predecessors.

It will, however, be conceded by all, save the most indulgent or the most incompetent of critics, that, both on the stage and the platform, the occasions are indeed rare when the performance is marked, in any high degree, by that perfection of sensuous charm which, although it is not the end and aim of

art, is in one form or another its indispensable adjunct—ought we not rather to say the very body through which alone its spiritual and intellectual manifestations are possible? I suppose, too, that for every schoolgirl who twenty years ago could manage to stumble through the "Battle of Prague," fifty might now be found who know something about harmony and the history of music, and are credited with the ability to play a Beethoven sonata or sing the "Erl-King" by Schubert. But the playing or the singing of the typical young lady who has "finished her musical education," even in that small minority of cases in which the piece might be rendered with perfect accuracy, can scarcely be regarded, by the most tolerant of listeners, as an exposition of "beauty of touch or tone."

Of the many different causes which work together to produce such an inadequate result for all the time, talent, and money so freely bestowed on musical education, many are evidently quite outside the scope of this paper; but one or two bearing more immediately on the subject in hand, if not fully discussed, ought at least to be emphasised here.

And, first, I would draw your attention to the too prevalent tendency to over-estimate tasteful expression, as being of far higher importance than the right method of producing tone; so that even the musical critic of the *Times*, in an operatic article which appeared May 20, 1879, says that a certain singer "possesses a legitimate tenor voice of fair compass and agreeable quality, which he knows how to employ without resorting to the so-called 'tremolo,' often criticised as an abuse of taste, *but really nothing more than a defect of method.*" Surely this is a most mischievous doctrine, and if carried to its legitimate conclusion it must produce nothing less than a generation of art-bunglers and professional *dilettanti*. To all holding similar views, if such there be amongst us, I would respectfully submit for their most thoughtful consideration two or three sentences from Goethe's "Essay on Dilettantism:" "The speaking to the feelings, the last effort of all poetical organisation, but which *presupposes the concurrence of the whole of art*, seems to the dilettante to be the *thing itself*." "The dilettante," he says again, "when he has done all he can, excuses his work by saying it is not yet finished. In fact it never can be finished, because it was not properly begun." And again, more pointedly: "From handicraft the way is open to rise to art, but not from botchwork."

Then, again, some masters are so accustomed to regard music from a scientific point of view that they are in danger of forgetting that it has not yet ceased to be an art. With them, beauty of touch and tone is sacrificed to knowledge about music and the power of answering questions. I have had numbers of pupils who, when they came to me, could tell me all about the scales, chords, and cadences, but who were utterly incapable of

playing the simplest air in anything approaching to a full, free, continuous, and graded tone.

But even among those masters who do recognise the importance of laying a good technical foundation, and work honestly to make their pupils really pianists and vocalists, there is such a difference of opinion as to what constitutes right method that it is pretty certain that, when circumstances render it necessary that a change of masters should be made, the poor pupil will be told that his method is altogether faulty, and that he must go over at least some portion of his work again. Thus, with some masters for piano the all-important matter is that the tip of the finger should alone touch the keys; others hold the flat of the finger, as being the more sensitive part, should be used. One trains for agility, another for smoothness, and a third for strength. One forbids his pupils even to look at an organ, while others, myself among them, contend that its practice affords a most effectual means for correcting a defective touch. Indeed, the whole time of this meeting could easily be occupied in merely enumerating these differences of opinion in regard to the piano alone, while the existing theories concerning the training of the voice are at least equally numerous. It is in the belief that, underlying all this mass of contradictions, it will be possible eventually to discover true and infallible principles on which a perfect method of practice can be based, that I have entered on this inquiry into the physiological and mechanical principles involved in the cultivation of beauty of touch and tone. I make no claim that I am myself in possession of such an ideal method; but I trust that, by placing before you some of the extremely contradictory views current among those whose position in the profession entitles them to be listened to with respect, if not to be regarded as actual authorities, there will be elicited from the members present such results of their own thought and experience as will, at any rate, tend to the advancement of a greater unanimity of opinion and practice than at present exists. I did hope that I should have been able to touch upon both vocal and instrumental music, but I find it impossible to do so without trespassing on the time allotted to the discussion which I trust will follow. I have no wish to indulge unduly in mere technicalities, but I must take for granted that my hearers are fairly acquainted with the anatomy of the vocal organs, with the theories of Helmholtz respecting the source of difference of *timbre*, and with the scientific distinction between vowels and consonants.

It cannot, of course, be unknown to you that there are masters, distinguished alike for their executive ability, their skill in teaching, and the perfect honesty of their convictions, who ignore, ridicule, or condemn as positively harmful, the notion that any useful purpose can be effected by the study of physiology in connection with vocal training. Thus Signor

Ferrari, although he belonged formerly to the medical profession, and strongly insisted on the danger to health which arose from a bad method of speaking and singing, did not find it necessary to explain the action of the vocal organs in his work on "The Formation and Cultivation of the Voice," contenting himself by indicating the general lines of practice in accordance with the Italian traditions, and giving some hints for the management of the mouth and breath, and for the correction of the more usual defects found in young singers; but beyond this "it must be left," he said, "to the conscientiousness of the master to correct *frequently enough* the numberless little faults which are the great drawback of singers generally."

Mr. Wilbye Cooper, a gentleman well known in London as an accomplished vocalist, in his pamphlet, "The Voice: the Music of Language, and the Soul of Song," *a little work which has been endorsed with the approval of many of our most excellent musicians*, throws down the gauntlet thus: "Here it may be as well to say something about the throat and neck, and the position in which every good singer appears while singing. In doing this I shall confine myself to that which can be *observed*, and avoid as much as possible any remark that may be calculated to perplex; feeling assured that the singer cares little about the formation of the vocal organs, or where tone comes from, provided the listeners are pleased and the result of his singing is success."

Friedrich Wieck also, in his "Piano and Singing," a book which, to those who can read between the lines, is absolutely brimful of the most valuable information and suggestions, never tires of satirising the idea that any aid can accrue to the teacher from physiological and anatomical knowledge. "Three trifles are required to be a good teacher of the piano and of singing: The finest taste, the deepest feeling, and the tenderest ear."

It is self-evident, indeed, that in the early history of any art it must in all cases be imparted by the experts to their pupils in a manner wholly empirical, because art necessarily precedes a knowledge of its principles. The old Italian masters could therefore teach only by example, and according to a "sound and just feeling for the beautiful, guided by the faculty of acute observation, which enabled them to distinguish what belongs to nature" (Seiler). But it is certain that, as the stream of artistic culture widens, the profession of teacher cannot be confined to those endowed with the three trifling qualifications prescribed by Herr Wieck, and then defect will be added to defect until it will be impossible to say who is right and who is wrong, except by reference to scientific principles. Anyhow, nowadays there seems to be no likelihood of securing good results except by pursuing the scientific method to its furthest possible limits; for, whether we approve or not, the physiological

methods already in existence are legion; and since "I saw it in print" is become almost as sure a passport to belief with *the many* as the "It is written" of former ages, the necessity for aiming at the attainment of scientific certainty is rendered imperative for all teachers whose object is the advancement of their art rather than the accumulation of filthy lucre.

As a wholly indispensable preliminary to the production of any tone whatever, whether good or bad, we must be supplied with breath. And here, at the very outset of our inquiry, we are met by differences of opinion as to the best manner of taking it. Thus many distinguished physicians, arguing chiefly, if not solely, in the interests of health, advise always to inhale through the nostrils. Professor Plumptre, in like manner, recommends this plan as being conducive to the cultivation of the voice, and he relates how that a certain Mr. Broster, a teacher of elocution, used to impart this as the great secret of success in speaking, demanding a heavy fee for it, and requiring a pledge that it should never be revealed; and if the pupil was in holy orders he was further required "to sign a bond, that in the event of his ever becoming a bishop he should pay a further fee of a hundred guineas." "Take this as a golden rule," says the Professor, "that the breath should, not merely when reading, though then I hold it indispensable, but at all times and under all circumstances be taken into the lungs only through the nose." While, on the other hand, Signor Randegger says, in his "Primer of Singing": "The air must be received into the lungs through the *mouth*, which must be slightly opened so as to *prevent it from entering through the nostrils*." But it seems to me that, as rapidity and perfect noiselessness in inspiration are indispensable when singing, it would be best performed by freely opening both passages. The danger pointed out by the advocates of nasal inhalation alone, that cold air drawn in rapidly through the mouth might cause inflammation of the pharynx, would be averted by the current descending from the nasal passages, which would prevent that entering through the mouth from striking against the back of the throat at all. For every other purpose than that of vocalisation, I should say that the breath ought to be drawn exclusively through the nostrils.

With regard to the *muscles* involved in the act of inspiration, it seems now to be very generally held that it should be effected through the co-operation of the diaphragm with the intercostal muscles. I was, however, much struck by a statement made at a former Meeting of this Association, by the most celebrated lady vocalist of modern times, that she had always raised her shoulders in taking breath when singing; and the President of the Meeting, himself a vocalist of eminence, added that he always found that his lady pupils required, at any rate occasionally, the assistance of that movement. Those who oppose this

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method seem to me to misunderstand the position, for although it is quite true that by clavicular breathing alone it is impossible to inhale anything like as much air as by the united action of the diaphragm and the muscles of the ribs, still any one may prove for himself that when as much breath as can be taken by those means has been inhaled, some fifteen or twenty inches in addition can be obtained by the elevation of the shoulders, which Dr. Gordon Holmes regards "as a kind of respiratory reserve, which nature presses into service if at any time an extraordinary effort of breathing be demanded." And in some directions which he has given for the practice of respiratory gymnastics he says: "As a rule the exercise should be restricted to abdominal and costal breathing, but an occasional clavicular inspiration in its proper place may be allowed, in order that the pupil, by being accustomed to the highest limit of chest expansion, may be enabled to practise the intermediate movements with more facility." He also recommends an occasional "retention of the breath, by fixing the chest walls after a moderate inspiration by the power of the inspiratory muscles, whilst the glottis remains quite open."

However the inspiration is managed, it is of the utmost importance that, the breath once taken, the singer should obtain complete control over its emission. This is generally regarded as a holding of the breath like that just alluded to, in which the inspiratory muscles are used to counteract the automatic force of those appertaining to expiration, while the glottis should take little, if any, share in the work. Thus, Mr. George F. Root (as quoted in Mr. Curwen's "Teacher's Manual") says:—"When the lungs are full you *can* stop the breath by shutting the throat, at the same time relaxing or letting go, as it were, the intercostal and abdominal muscles. *This is hurtful*, for it compels the delicate organs of the throat to bear an undue pressure, and leaves the great strong muscles, which should do the work, in idleness. When the lungs are full the will should, as it were, keep hold of the abdominal muscles, and by acting upon them gradually for gradual breathing, and suddenly for sudden breathing, leave the throat with only its proper work to do, viz.: quietly open during the operation of breathing, the vocal cords drawn easily together during the production of tone, and the windpipe acting freely and flexibly in its lengthening and shortening for difference in highness and lowness of sound. This is the delicate work of the throat. With the rough work of forcing the breath, or holding it back, *or in any way controlling it*, the throat should have nothing to do. That is the office of the intercostal and abdominal muscles." This method, which is well-nigh universally recommended, although not so generally adopted in actual singing as is usually supposed, is very fatiguing, and it has consequently been termed by a French author (Dr. Louis Mandl, in his "Hygiène de la Voix") "the

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vocal struggle" (*la lutte vocale*). Signor Randegger, in like manner (in his "Primer of Singing"), directs that "the *most determined will* must be enforced in order to resist the natural tendency of the air to escape."

The idea that shutting the throat, in order to control the emission of the breath, is hurtful, arose, in all probability, from the belief that it was performed solely by the straining together of the vocal cords by the action of the intrinsic muscles of the larynx; and if this were the only means of closing it the practice would obviously be eminently injurious, for it is admitted by the most eminent physiologists that they are not strong enough for that purpose, when the full power of the respiratory muscles is exerted either in inspiration or expiration. This matter is fully explained in a paper by Dr. Wyllie, entitled "Observations on the Physiology of the Larynx" (published in the *Edinburgh Medical Journal*, vol. xii., 1866), for which a gold medal was awarded by the University of Edinburgh. He says: "Now it must be borne in mind that by closure of the glottis complete stoppage is effected not only of inspiration but of expiration, the most powerful efforts at either being rendered quite ineffectual. This is, no doubt, in a sense due to the action of those intrinsic muscles of the larynx which close the rima, but the strength of these comparatively minute structures is surely in itself inadequate to resist the enormous power which the air may be made to exert upon the glottis from within during a forcible attempt at expiration, as well as its pressure from without when we try to inspire. From this consideration one is naturally led to suspect the existence in the glottis of some well-adapted valvular arrangement, suited to control both the entrance and exit of the air." With the view of ascertaining whether this were the case or not, Dr. Wyllie made some very interesting experiments upon the detached human larynx, and found that by merely approximating the edges of the false vocal cords and forcing a strong current of air through the windpipe, the ventricles of Morgagni were filled with the air, which caused them to bulge inwards and upwards, and their lips to press so closely together that all exit of the air through the larynx towards the mouth was totally stopped. By reversing the experiment and driving air downwards, as during inspiration, the true cords were similarly acted upon, thus preventing the passage of the air towards the lungs. "The conclusion," says Dr. Wyllie, "to be derived from these experiments is obvious. There is within the larynx a double valve, which is capable of controlling both the exit and the entrance of air. . . . A laryngoscopic examination" [on the living subject] "fully confirms the view which I have just stated. The following phenomenon may then be observed:—

"First, When the glottis is simply closed, and no effort is made either to take in breath or to expire, the false cords are

separated by a very narrow interval, through which the edges of the true vocal ligaments may be seen in close apposition.

"Second, When an effort is made to *inspire*, the superior cords meet in the middle line so as to leave only a very small triangular opening posteriorly, through which there still may be caught a glimmering of the pale surface of the true ligaments.

"Third, When expiration is attempted, the false cords are immediately coapted throughout their whole length, and if the effort made be powerful the parts above are observed to arch or curve outwards without allowing the air to escape (Czermak). This swelling out of the mucous membrane at the upper part of the larynx can be due to nothing but the inflation of the ventricles of Morgagni beneath."

It would appear, then, from this discovery of the beautiful apparatus furnished by nature for the control of the emission of the breath, that it cannot be hurtful to close the throat in order to hold the breath, and the exertion involved in the "vocal contest" is thus shown to be altogether superfluous.

Any one can prove for himself the ease with which breath can be controlled by this mechanism, for by simply filling the lungs and *catching the breath*, that is, by approximating the false cords, he will find that he can with the greatest ease maintain a whispered expiration for as long a time, or very nearly so, as he could during actual singing. And as long as the pressure is maintained below, the slightest act of volition will intercept the current and hermetically close the throat, which can be again and again opened and closed. This alternate opening and closing can be performed with considerable rapidity, a tiny explosive sound accompanying each emission of breath.

Having obtained, by one means or another, a supply of air and a control over its expiration, we must now endeavour to ascertain in what manner we may best apply it to the production of vocal sounds. The problem is really twofold—Firstly, to determine wherein rightly produced tones differ from those which are wrongly produced; and, secondly, to discover the means by which the right method of their production may be brought under the direct control of the will. And here the various methods advocated by rival theorists are indeed legion, the ideas upon which they are based being, in some cases, derived from the merely personal predilection of the writer for some particular quality of tone; in others, from a fancied resemblance in the action of the vocal apparatus to one or other class of humanly constructed musical instruments. In only a very small minority of those who have written on the subject do we find that an unprejudiced and really scientific mode of investigation has been pursued, and even these have for the most part arrived at very one-sided conclusions, in consequence of their ignorance of the discoveries of their fellow workers.

To give even a bare outline of all these conflicting theories is manifestly impossible in a paper of reasonable limits, but I have tried to select those which present the widest contrasts, or whose authors are, by their prominence in the musical world, the most powerful in their influence on the current of contemporary opinion.

In but one work do I remember to have seen any idea expressed that some persons are so constituted that, although they are neither deaf nor dumb, even rightly directed practice, however earnestly pursued, must necessarily fail to enable them to sing. Miss Sabilla Novello, in her tract "Voice and Vocal Art," says: "The most careful anatomists have failed in discovering any material difference between the mechanism of throats capable of musical cultivation and those unfitted for song. Sound is merely produced by a current of air passing from the lungs through the larynx and glottis, which, vibrating at its thin edges or lips, creates musical tones, heightened and lowered at will by the contraction of certain ligaments and muscles. Thus it would appear that every human being possesses the power necessary to song, *but experience proves the contrary;* and this fact must ever remain an enigma to those who endeavour to analyse the human voice."

Mr. Frank Romer, in his "School of Singing" and his "Physiology of the Voice," professedly bases his method on Savart's experiments with flexible tubes, but he is evidently much influenced by a personal objection to anything approaching to reediness of tone. "The human voice," he says, "has two distinct methods of producing tone, one method by expanding and inflating the tube, the other by contracting the tube at certain points." He considers that the sounds of the speaking voice are produced by contraction of the throat, while in singing the tones are produced in the windpipe. "It naturally will be asked why nature has given us two methods of producing the tones of the voice, one so good, the other so bad. The reason is simple. We have two distinctly opposite feelings to express in the world—our likings and our dislikings—of things with us and things against us. These two qualities of sound in the human voice may be said to be infinite in their variations and intensities. . . . In fact, I believe it to be one of the laws of nature, that all sounds generated by a pure column of air are pleasant to our nervous system, while sounds produced on the system of a reed, or by friction or contraction, are unpleasant and even painful to persons with delicate nerves. A sound produced by the filing of a saw will produce this result. I am aware that sounds are produced in many different instruments by a combination of these two methods; but, upon minute examination, it will be found that the tones of such instruments are only pleasant to the ear when the vibrations produced by the reed are neutralised by

the more powerful vibrations of the column of air. For instance, the violin produces its tones by a string vibrating a column of air around it. But the method of first setting a string in motion is by contraction or friction; consequently its sounds are unpleasant until the performer gains delicacy with the bow, in making the string vibrate as independently as possible of the frictional action. It is exactly the same with the clarinet a good tone depends upon the delicacy of the action of the *reed* in sustaining the *tube* in a state of vibration. From these observations, by analogy of musical instruments, it will be seen that whenever the *reed* overpowers the *tube* a bad quality of sound must be the result."

As a consequence of these premises Mr. Romer's directions are: "It must be distinctly understood that the throat has nothing to do in the alteration of the ascending or descending notes, when the tones are produced naturally, but that the different scales and intervals are formed by the free action of the diaphragm on the column of air; and if we have recourse to any modification or contraction in the throat, our intonation will become uncertain, and we shall ultimately lose all power over the musical quality of tone." The pupil's attention, in order to obtain a right control over tone, is to be fixed on the sensations caused by the ascent and descent of the diaphragm; thus, "when the voice descends the scale, a sinking sensation must be experienced at the chest."

Mr. George J. Lee, who in the year 1870 published at Dublin a work entitled "The Voice: its Artistic Production, Development, and Preservation," attempts to prove that the vocal organs, throughout their entire compass, act on the principle of the flute, and claims the discovery as his own. In support of his "correct theory of voice" he says that the windpipe simply conveys breath to the larynx, in which the sound is generated, and thence driven by the direction of the wind into the pharynx; "that, as a consequence, and according to all principles of acoustics, this portion of the tube—the pharynx—must, by its shape and dimensions, modify sound; and that it does undergo great changes in its shape and dimensions, by reason of the fact that the larynx rises into it and descends out of it, thereby lengthening it and shortening it during the ascent and descent of the notes of any scale; that since we notice that this tube alters its dimensions during the production of notes of different pitch, and that at the same time the vocal ligaments undergo no appreciable changes in length or otherwise save upon a change into a different register" (on this point he quotes the authority of Czermak), "it must be to the alteration in this tube that pitch of voice is due, and not to any change in the vocal ligaments. Lastly, that the action of the ligaments is similar to that of the lips, since viewed with the laryngoscope during the emission of vocal sound, they are

seen to form themselves around the aperture for wind, with thick rounded edges and pursed outwards, as are the lips during the production of notes on the flute." He, moreover, holds that in *gliding* from one note to another a semitone apart there is a slight modification of the glottis, in the same way as in the lips of the flautist, who, while he alters the length of the tube for distinctly different notes, "only extends or contracts his lips" for the intermediate slur of a semitone.

In reply to those who would argue that in many voices the vocal ligaments are shortened and lengthened, are tightened and relaxed for altering the pitch, he says that in "that case nature acts vicariously. The duty of the pipe can, to a great extent, be thrown on the vocal ligaments, but only by a forced and unnatural action, which, however successful for a time, cannot last; it must end in bankruptcy of voice."

As to the practical value of his discovery, he claims that the cultivation of the voice on the principle of strings involves undue tension, and on the reed theory it necessitates great effort; in both cases wearing out the voice prematurely, besides inducing a bad quality of tone, whereas, "viewing the vocal organ as a flute instrument, a very different result takes place. First, the voice is developed by following up and encouraging the natural action of the instrument, as seen in the ascent and descent of the larynx, and the other changes in the apparatus generally. There is no effort used, and as a consequence there is no fatigue; there is no straining of parts, and therefore there is no lesion or diseased result; there is no string or reed dreamt of, and consequently there is no quality of tone sought for, but the soft, liquid, and melodiously clear note of the flute."

Concerning method of study he says: "Some teachers direct their pupils to control the movement of the larynx so as to prevent it as much as possible ascending or descending for the production of sounds. With them, fixity of larynx is the great object to be gained, and hence they go on producing voice by straining at the vocal ligaments, and wearing out the instrument by the quickest possible plan. Such a system should be carefully guarded against. The *natural action alone* is that which should be sought for; and the only control to be exercised is that which is requisite to steady the larynx during the production of any one tone."

He directs pupils to vocalise exclusively on *oh* or *aw*, and says that "the injurious method usually adopted by singing *ah* not only induces an unpleasing quality of tone, but establishes a braced or tightened condition of the organs highly detrimental to their proper or healthy action."

One hint which he gives, for the comfort of those who suffer from dryness of the mouth when singing, is so rich that I really must not omit it. The presence of saliva is "essential to the movements of the tongue, pharynx, and mouth generally, from

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its lubricating qualities. The Italians, who *speak with a large quantity of it about the tongue and teeth*, give that liquid character to their language which, together with the softness of the vowel sounds, renders it the sweetest and most musical in the world." Mr. Lee, having found that while solids introduced into the mouth encourage the flow of saliva, liquids do not, was led "to conclude that the introduction of some insipid and solid foreign body whilst singing would be productive of the desired result, and found that a small flat piece of slate-pencil, placed inside the lower jaw, accomplished the required condition. The sympathy existing between the mind and the salivary glands is certainly not less than that existing between mind and any other portion of the human organism. And in this sympathy lies the secret of the mind's almost material power over every portion of our frame. In the point before us, its immediate operations would be, by *some rapid association*, to train the glands to fresh productions of the fluid. The great object, however, should be to dispense with all artificial stimuli except in cases where, without their use, the dryness of the mouth would offer an obstacle to vocalisation; and this object is to be brought about through the mind."

Another instrumental theory of the vocal mechanism on which a method of training has been based is that promulgated by Ferrein, who originated the term "vocal cords," and believed that their action was analogous to that of the strings of a violin, and that they were set in motion by a stream of air acting like a bow, the difference in pitch being caused *solely by the alteration of their tension*. I think that it must have been in consequence of some such a theory as this that Mr. Curwen, in one of his early works ("Singing for Schools and Congregations"), directed his readers "to let the larynx *rise* for the production of *low* notes, and *fall* for the *high* notes"; while the sound common sense which, among many admirable qualities, has ever been a leading characteristic of his teaching, dictated the foot-note—"secure the open *ah*, and you need not think about the larynx."

It is, indeed, perfectly true that in ascending passages the front of the thyroid cartilage does more and more approximate itself to the cricoid cartilage immediately beneath it, but the most cursory observation will prove that the larynx, *as a whole*, *rises* for *high* sounds and falls for *low ones*. And it is therefore unfortunate that in Professor Huxley's generally so admirable "Manual of Elementary Physiology," in the explanation of a diagram illustrating the mechanism of the vocal organs, no notice is taken of this ascent and descent of the whole larynx for sounds of different pitch, but it is made to appear as if Mr. Curwen's instructions, above quoted, were really correct.

In Professor Hullah's works on voice cultivation, which are founded mainly on Professor Willis's papers in the "Cambridge

Philosophical Transactions," he says: "From the difficulty and till lately the impossibility of watching it in the living subject, the action of the larynx in the production of sound is still imperfectly understood. Nor does that which is certainly known about it encourage us to hope that the extended knowledge would enable the will to act more directly upon it than it does at present"; and, quoting from Willis, he adds: "*There is no necessity for seeking any power of altering the quality of* the notes in the *larynx itself.*" He, therefore, consistently devotes his attention to the alterations in tone which take place in the supra-laryngeal organs, and ignores everything which tends to concentrate the pupil's attention upon the larynx itself during vocalisation. He recommends the vowel *ah* as the best one to use for the first exercises, justifying his choice by citing Willis's discoveries concerning the scale of vowels, which, he says, indicates the order in which they should be attempted. "He should begin with and often return to the practice of *aa;* begin with it because it is the easiest, and return to it because experience has shown it to be the most useful. The practice of *aa* had best be followed by that of *o*, and that of *o* by that of *a; oo* had better come next, and *e*, incomparably the most difficult, last."

Mr. Wilbye Cooper, in his pamphlet already alluded to, commences by drawing attention to the distinction (too often overlooked by the public) between a good voice and a good singer. He says: "The quality of sound which is most charming to the listener is that which is most devoid of a reedy character. Reediness of tone may be described as that which is somewhat akin to the noise we are able to produce with a comb and paper. *Purity* of tone is undoubtedly that which is round, liquid, smooth, and mellow. To be the *best possible* singer, one should undoubtedly possess the best voice possible, and the highest amount of musical and poetical intelligence with it; but a *really fine* singer might possess only an ordinary voice, and a really fine voice might be almost lost from want of musical feeling in its possessor. The difference, then, between a good voice and a good singer is the difference between *sound* and *sense*." He then proceeds "to show how the one may be improved, and the other, to a degree, cultivated." He bases his method of teaching entirely upon the cultivation of the organs of speech, and his directions are devoted to external matters entirely: "Directly a singer, who produces the voice properly, takes up a position to sing, the back part of the head is raised, the chin is kept down, the throat is set back, the back of the neck is made as straight as possible, and the whole body is made to assume an upright posture; the lips and mouth are opened *naturally*, never wider than the *character* of the sound of each *word* demands. By these means it is evident that the throat is brought into its

most open form, and the voice is given a free space from the chest into the hollow of the mouth (or bell of the instrument). In this position the voice makes no guttural noise, and in this position must the voice of the singer be produced before it is possible to decide upon its real quality. The utter farce of opening the mouth as wide as possible, and singing every note and passage to the open sound of the letter *a*, is too *preposterous* to bear a moment's reflection, except *that* plan be adopted as the shortest way to ruin." I must remark here that although I have had many pupils who have told me that their former instructors had directed them to open their mouths as wide as possible, I do not remember to have seen it recommended in any work whatever. Mr. Cooper continues: "The unnatural noises, which are too frequently made to serve for voice, are produced by reversing the order of things. Thus, it will be found by *raising* the chin, and at the same time lowering the back of the head towards the shoulders, the throat is closed, the chest voice is entirely prevented or cut off, and the noise produced seems to issue from the back of the tongue, giving the idea of half-strangulation. It is impossible for those who pretend to sing in this manner to utter pure vocal sound or to give the true character to words. They seem to be continually striving to introduce the letter *r* into every word they meet with, and so contrive to produce a kind of feline noise upon almost all vowels. The result of close observation will prove that pure vocal sound issues freely from the chest and requires a clear passage, and that character is given to it by the mouth and lips in declaiming words. The tongue, having no part to perform except that of assisting the lips to *articulate*, should remain flat in the mouth, and never be allowed to move. The chin should *never* be raised, nor should it ever be allowed to vibrate in the slightest degree while singing a number of notes to one word. The mouth having so important a part to perform, the singer must not for a moment imagine that the face can be kept continually in the smiling position, so generally recommended in singing tutors. There are certain words that cannot be properly sung except the mouth assume a smiling position; but there are others that cannot be sung at all if the singer attempt to smile at the same time." In these directions there is but little that can be considered as tending to improve the voice, the assumption being rather that there is no improvement necessary, the pupil only requiring to avoid bad habits; and this idea is strengthened by his remarks on vocalisation. "Sounds," he says, "are represented in language by *vowels;* the art of vocalising, therefore, must consist in the ability to sustain any vowel sound upon any given note, or to repeat several notes upon any given vowel-sound. It is, then, of the greatest importance that a right conception of the *true sound* of each vowel should be arrived

at. It must be borne in mind that the voice cannot be sustained upon more than *one* at a time, and that consonants form *no part* in a vowel sound. The safest mode to adopt . . . is to take the accepted sound as described in the dictionaries, and then to adhere strictly to it. If these remarks are thought over and put in practice by any one having a correct ear for sound, I am quite certain that real harshness cannot appear at the same time even in the most ordinary voice, for the simple reason that *no vowel has a harsh sound of itself*."

His first exercise is to sing a simple melody, using instead of words the vowels *a, e, i, o, u, according to their usual names*. After this words are to be used, taking care that the consonants are to be considered as articulations only, and must not be dwelt upon in the least degree. "To try to make a sound upon a consonant is simply absurd; yet it is so much the custom to mix up vowel sounds with consonant articulations, that nine-tenths of those who try to speak or sing, utter noises upon certain words that may well be described as unearthly; appearing to issue at one time from the nose, at another from the back of the tongue, at another from the top of the throat with the tongue curled up—the latter approaching nearer the croaking of a frog than the natural voice of any human being." Mr. Cooper is justifiably severe on those popular singers—he will not call them artists—who vulgarly display their ignorance of the first principles of vocalisation by murdering the Queen's English, but, indeed, with him the pronunciation is everything. "Thus," he says, "it will be seen that language (if not the root of song) gives *character* to the sounds that a speaker or a singer should produce, and *musical notation* the pitch; and whether the musical notes be written high or low, the *character of the sounds must be taken from the words*." Nowhere in this book have I found any instructions for eliminating the reedy character from a voice, or for inducing that "purity of tone" which "is undoubtedly round, liquid, smooth, and mellow"; nothing beyond the repeated assertion that "when any given note or passage receives the pure vocal sound of the word written under it, the voice of the singer cannot be at the same moment disagreeable, for the reason before stated, 'that no vowel, or *vocale*, represents a harsh sound.'"

In concluding these extracts from Mr. Cooper's book, we should, I think, commend his patriotic admiration of the sounds of his native tongue, and the practical though unobtrusive reproof he gives to those who, even now, talk so glibly about the unmusical character of our beautiful language. But, considering the light which, by Mr. Ellis and others, has been thrown on the infinite variety which exists in the shades of vowel tone, and the modifications to which they must be subjected when sung at different altitudes of the vocal com-

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pass, I cannot but regret that he did not advise his readers to consult some more reliable authority on the true mode of their pronunciation than an ordinary dictionary. And as to his theory of their necessarily pleasing character, a short extract from Professor Willis's paper on "Vowel Sounds" ("Cambridge Philosophical Transactions") will sufficiently expose the fallacy of his views: "Vowels are quite a different affection of sound from both pitch and quality. Thus we say a man has a clear voice, a nasal voice, a thick voice, and yet his vowels are quite distinct from each other. Even a parrot, or Mr. Punch, in speaking will produce *a's*, and *o's*, and *e's*, which are quite different in their *quality* from human vowels, but which are nevertheless distinctly *a's*, and *o's*, and *e's*."

Signor Ferrari takes a very different view from that of Mr. Wilbye Cooper, and attributes the bad tone of English singers especially to the muffled way in which they speak, by which the natural tone of their voices is disguised and spoilt. "The only difference," he says, "between speaking and singing is, that in speaking we *strike* the sound impulsively and immediately leave it, whereas in singing we have to *sustain* the sound with the same form of articulation with which we struck it impulsively. Little or no attention is paid to the *tone* in which *children speak*, consequently they often contract bad habits of intonation from the earliest age, and as they grow up what is mere *habitual* tone is mistaken for the natural voice. The young ladies of the present day 'speak' in a subdued, muffled tone, or what might be called a semi-falsetto, in consequence of which very few natural voices are heard. Foreigners generally speak in the natural tone of their voices." I am inclined to think that our national tone is not the result of a lazy way of speaking alone, an outcome of our undemonstrative character, but that the climate has something to do with it, its humidity and variableness tending to make us speak with our mouths nearly closed. Another view of this question will be presented later. Ferrari insists upon the necessity of vocalising upon *ah*, and says that a pupil can generally find out the true way of producing tone by being made to *read* "in a deep tone, as though in earnest conversation, beginning two or three notes below what they consider their lowest notes. But when a young lady, who has been in the habit of speaking in this muffled tone, is shown what her real voice is, instead of being gratified at possessing a fine organisation for singing she is generally annoyed, the fulness of the tone being offensive to her ear, and very frequently will not for a long time sing in her natural voice, but continue to use the habitual tone. The result is that not only does she never sing well, but soon begins to sing out of tune, and finally loses her voice, and in too many instances materially injures

the chest. Indeed, I have no hesitation in saying that hundreds of young ladies bring upon themselves serious chest affections from a bad method of speaking or singing. Singing in classes and practising songs or solfeggi with florid passages, before the voice (by which I mean the natural production of tone) is cultivated, are two fatal errors. Another general error in the commencement of singing is to make the pupil begin the sound *piano* and make a *crescendo* upon it. This causes the pupil to force the breath and thrust it forward, veiling the sound and causing the chest to collapse. By pursuing such a method the voice, instead of developing, becomes weak and husky, and the pupil never obtains sufficient command of the breath to be able to sustain a sound, even after years of practice. There is no doubt that, provided the *tone be produced according to the principles laid down by nature*, singing tends materially to the healthy action of the respiratory organs, and might frequently be employed with advantage as an aid to strengthen them."

It will be observed that, admirable as are these remarks, Signor Ferrari does not attempt to show in what way "tone produced according to the principles laid down by nature" differs from that which, in the mode of its production, violates those principles.

Very different in every way, and certainly much more scientific, is the method adopted, in his "New Treatise on the Art of Singing," by the distinguished inventor of the laryngoscope, Señor Manuel Garcia, whose name marks an epoch in the annals of vocal physiology. However earnestly and successfully later workers may have laboured in the same sphere, it is, directly or indirectly, to his observations that we are indebted for the establishment of what I may, perhaps, characterise as the orthodox theory of voice production. In this the vocal mechanism is regarded as corresponding, in the main, with that of an instrument with a double reed, in which the *pitch* of the sounds is caused by the length and tension of the vocal ligaments, and is also influenced by the greater or less pressure of the air by which they are set in motion; difference in *timbre* being partly due to the greater or less approximation of the lips of the glottis, and to whether the whole bulk of the cords, or only their free edges, are caused to vibrate; but chiefly to the proportion in which the various partial-tones are reinforced by the resonance of the variable cavities though which they pass to the outer air, and of other parts of the frame contiguous to the vocal apparatus. It is true that Garcia's explanation of the *registers* (which, however, need not be discussed now) has met with much opposition. Indeed, in its entirety, it does not commend itself to me; and the central point of his system of practice—the shock of the glottis—has been subjected to much misconception and

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perversion, chiefly, as I suppose, because, when he wrote, the functions of the ventricles of Morgagni were wholly unknown; but the directions given by him for the cultivation of tone are very minute, and their importance will justify the very copious quotations I am about to make from them.

For the production of vocal tone, he says: "It is not necessary that the glottis should be perfectly closed after each partial opening; all that is needed is an opening sufficiently small to develop the elasticity of the air opposed to it. The rush of air, however, that is escaping through the half-open orifice will be quite perceptible, and will give the sound a veiled character, at times extremely dull. We may thence conclude that brilliancy of voice results from the *entire* closing of the glottis after each beat. Economy of the breath is another advantage derived from this complete closing of the glottis." Brilliancy of *timbre* is also caused by the larynx assuming a high position in the throat, and rising towards the soft palate, the latter dropping to meet it, thus causing a gentle curve in the vocal tube; while when the larynx is low and the palate high, the tube is lengthened and the angle which the vibrations must pass becomes nearly a right angle, and a sombre character is imparted to the sound. After pointing out how erroneous is the idea "that the more we open our mouth, the more easily and powerfully can sounds be emitted," he says: "To open the mouth, the lower jaw should fall by its own weight, while the corners of the lips retire slightly. This movement, which keeps the lips gently pressed against the teeth, opens the mouth in just proportions, and gives it an agreeable form. The tongue should be loose and motionless, without any attempt to raise it at either extremity; the muscles of the throat should be relaxed. In this position breathe slowly and long. After being thus prepared, without stiffening either the larynx or any other part of the body, calmly and with ease attack the tones very neatly by a slight motion of the glottis on the vowel *a*, very clear; this motion of the glottis is to be prepared by closing it, which momentarily arrests and accumulates the air in this passage; then, as suddenly as the pulling of a trigger, it must be opened by a loud and vigorous shock, like the action of the lips energetically pronouncing the letter *p*. If this movement be properly executed, the sound will come out bright and round. Care, however, must be taken to pitch the sound at once on the note itself, and *not to slur up to it, or* feel for it. The pupil must also be warned against confounding the articulation or stroke of the glottis with the stroke of the chest, which latter resembles the act of coughing, or the effort made in expelling some obstruction from the throat. This stroke, or coughing out the notes of the chest, causes a great loss of breath, rendering the sounds aspirated stifled,

and uncertain in tone. Some masters recommend the use of the syllables *pa*, *la*, *ma*, &c., in order to acquire precision in striking the notes; but in our opinion this plan (by which the lips, tongue, and other organs not concerned in the emission of voice, are set in motion) has the disadvantage of *merely disguising the faulty articulation of the* glottis, without possessing any power whatever of correcting it. This first lesson should be insisted on, as it is the basis of all teaching. I again recommend the shock of the glottis as the *only* means of attaining the sounds purely and without bungling."

He affirms that the upper glottis, *i.e.*, the space between the so-called false cords, *never closes*, its function being "to circumscribe an elliptical space immediately above the lower lips, contracting and enlarging it, so that, at will, the volume and quality of the voice may be constantly modified." So far, however, as I am acquainted with his works, I have seen no directions for rendering this upper glottis amenable to volition.

"Unchangeable firmness, purity of sound, and perfect harmony of the *timbres*, constitute steadiness of voice. A well-sustained play of the respiratory organ, a firm contraction of the glottis, a free movement of the pharynx (mechanical acts that should be quite independent of each other, yet regulated in their combined action by the requirements of the passage), constitute those mechanical means by which steadiness of voice can be attained."

Garcia attributes much importance to the proper adjustment of the pressure of the breath to the tension of the vocal cords. "During *pianissimo* practice the pharynx will be reduced to its smallest dimensions, and will dilate in proportion to the increasing intensity of sounds; returning afterwards by degrees to its original shape, as the sound becomes weaker. Care must be taken neither to raise nor lower the intonation while strengthening or diminishing the notes. These are very general faults; and in order to overcome them pupils must carefully study the system of compensations which we are now about to explain. In whatever position a singer may have his vocal tendons placed, if he proceed to expel air with increasing force and vigour, the notes, in spite of himself, will rise, because the increasing pressure of air increases the tension of the vocal tendons, thus causing more rapid beats and explosions. This fact may be easily ascertained if, during the emission of a note, a slight blow be given to the region of the stomach. The effect will be to raise the voice a second, a third, or even more than that; and the elevation resulting from the pressure ceases as soon as the latter is removed. Hence, in order to produce perfect uniformity of intonation from *pianissimo* to *fortissimo*, it is necessary that the vocal ligaments should, by a gradual slackening, correct that tendency of the tone to rise above its proper pitch—the exact

opposite being the plan pursued in returning from *fortissimo* to *pianissimo*." In consequence of the difficulty of this adjustment, the practice of the *crescendo* and *diminuendo*, which some writers have regarded as the very first step to be taken, must be put off till the pupil has acquired the power of sustaining sounds with perfect evenness at every degree of intensity.

The disfavour with which the "shock of the glottis" is regarded by many teachers arises, in my opinion, from the idea that it involves a general tightening and straining of the throat, and must therefore tend to the injury of the vocal organs. Garcia does indeed insist, over and over again, on the necessity for the lips of the glottis to press firmly against each other (in one place, if I remember rightly, he even says they must be "*pinched together*"); but he takes care to urge with equal force the importance of perfect freedom and flexibility of every other part of the throat and mouth. Among other objectors, Dr. Streeter (in his "Voice Building"), whose infallible recipe for good tone is that the focus of the vibrations should be located in the arch of the mouth, evidently misunderstands the question. He says, "in some cases the tone hits or clicks against the throat, and below its true pitch. It rebounds from this position to some indefinite one, and the result is that the language is not understood, the intonation is false, the quality of the tone suffers, and the throat is in many cases seriously injured. The same means used to correct other defects will surely remedy this. Articulate the notes, and do not attempt to squeeze them indefinitely through the mouth. Let the articulation of the language and the location of the tone be simultaneous. The click just described is an interruption of those movements which produce sound. No defect is more general; none, perhaps, more injurious. Throats are debilitated by it, and it is impossible for it to be otherwise, as it is produced by a violation of those laws of movement necessary for the healthful development of the vocal apparatus. Would it seem possible that educators in the department of voice should advocate the use of an exercise which is a direct violation of those laws? Yet such is the fact, and this click, their so-called 'stroke of the glottis,' is insisted upon as a desirable exercise for the development of voice. We pronounce it wholly incorrect and injurious." I think we must agree with Dr. Streeter, that *if his account of the shock of the glottis be correct*, its use is utterly unjustifiable.

Mr. Curwen, too, although (in his "Standard Course") he places the shock of the glottis first among the three things to which "*daily attention must be directed*," has, I think, mistaken its nature. "When Garcia and other voice-trainers speak of the 'shock of the glottis,' and when Dr. Rush,

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Mr. Melville Bell, and other elocutionists speak of clear 'explosion' of vowel sounds, they refer to the firm closing, followed by the distinct opening, of these lips of the larynx. The action of the lips of the mouth in pronouncing strongly the letter *p*, in papa, will illustrate this; and the 'shock of the glottis' may be felt in a slight cough, or in pronouncing clearly the letter *g*, as in game, or *k*, as in keep. This 'shock' does not require force, but only definiteness of action. It must also be delivered with as little breath as possible. The word skaalaa (*aa* as in father), which many voice-trainers use for their exercises, has this advantage, that its first syllable necessitates that clearly marked 'explosion' of the vowel of which we speak; but in using it the *s* must be scarcely heard, and the *k* must be delivered sharply." When we consider how strongly Garcia objects to the use of consonants in singing exercises, it becomes evident that Mr. Curwen's teaching concerning the "shock of the glottis" differs very widely from that of the originator of the term.

It has been reserved for Mr. Charles Lunn (in a series of papers published in the *Orchestra*, and in his "Philosophy of Voice") to explain the true nature of the explosion which Garcia desiderates, but of which he has given a description that is physiologically incorrect, and also to show why, when it is habitually practised, it exerts so beneficial an influence in the development of the voice. The principles laid down by Mr. Lunn are avowedly formed upon the discoveries of Dr. Wyllie, to which I alluded when speaking of the means by which the emission of the breath is controlled. I regret that I have found it quite impossible to do justice to his views by means of quotations from his works, and I must therefore venture, as briefly as possible, to present in my own words what I conceive to be their most important features. I must ask you to remember that the lips of the ventricles are placed immediately above the true cords, and that the vibrations of the latter are to be regarded as forming the raw material, if I may so express it, which, by the modifications that it undergoes in its passage through the mouth, becomes converted into speech or song. It must then appear but reasonable that if we can, by any means, secure the perfect production of this raw material, we should avail ourselves of it in the very first stage of vocal training; the problem being to find out how its source may be placed under the direct control of the will. This is afforded by the same mechanism which was found so easily to govern the breath during simple expiration. The lungs being filled with air, and the edges of the false cords being brought into contact by a simple act of will—by merely *catching the breath*, in fact—the automatic action of the expiratory muscles causes a complete inflation of the ventricles, their lips being forced more tightly together

by the pressure of the air within. If at this moment we will that the imprisoned air shall escape, it will do so with an explosive noise similar in effect to an unvoiced consonant. For my own part, indeed, I consider it to be actually a *laryngeal consonant*. But if, before allowing this escape of breath, the true vocal cords are approximated sufficiently to be thrown into vibration, the compression of the air *in* the ventricles, causing, as it must, a downward pressure on the flat upper surface of the vocal cords, intensifies and steadies their action, and, on the emission of the breath, the resulting vowel sound will be clear and ringing. As long, too, as the pressure from below is maintained with unvarying force, so will this sound be maintained with unvarying power. It is this downward pressure of the air in the ventricles upon the upper surface of the vocal cords which insures that steadiness which is one distinguishing characteristic of rightly produced vocal tone. This tone, however, will not be *necessarily* beautiful, although so far as it depends on the action of the larynx it may be quite rightly produced, since, as you must all know, the *timbre* of the voice is subject to great modification in its passage through the supra-laryngeal cavities. But whatever other qualities it may have, it will most certainly possess a firmness of texture unattainable by any other means, and its emission will cause no strain on the vocal cords, or undue exertion of any kind. If, on the contrary, this inflation does not take place, it is evident that the vocal cords themselves, or the very slight muscles which regulate their tension, will have to bear all the pressure of the air by which they are caused to vibrate—a force which must often greatly exceed that ordinary pressure which Dr. Wylie considers they are unable to resist. Energetic vocalisation, while the ventricles are not inflated, must therefore involve either the forcing of the vocal cords from their right position for singing towards that which they assume when in a state of rest, thus producing a bad quality of tone, or an actual injury to the throat, through their being subjected to a greater amount of tension than they are intended to bear.

The inflated ventricles may also be regarded as playing the same part in the production of vocal tone as the mouthpiece does in brass instruments—*i.e.*, concentrating the vibrations before they enter the resonant tube. We see then that what Garcia calls the "shock of the glottis" is really a shock of the *upper glottis*, which he thought was never closed. By the continued practice of this shock, the power is eventually obtained of inflating and maintaining the inflation of the ventricles, even during the singing of words containing consonants; but in that case their lips will not be brought into actual contact, since it is manifestly impossible to set up a complete obstruction to the passage of the breath at two places

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in the vocal tube at the same time, but only near enough to insure the entrance of the breath, and its consequent downward pressure on the vocal cords. If, however, before this power is obtained, the student habitually uses real words when singing, or prefixes consonants to the vowels upon which he vocalises, the quality of the tone will certainly be impaired, since not only must such a proceeding divert his attention from the point at which the sound is generated—for the nerves of volition will then be occupied in transmitting a highly composite message to widely separate parts of the throat and mouth at the same instant—but the necessary regularity of the vibrations will be rendered impossible through the density of the atmosphere above and below the vocal cords being unequal. Whether produced independently, or accompanying vowels preceded by consonants, the presence of this distension of the ventricles can always be ascertained by simply feeling with the finger and thumb just above the wings of the thyroid cartilage, and it is their habitual expansion which in process of time causes that width of throat which so generally distinguishes those vocalists whose method of producing tone is correct.

Another result of the inflation of the ventricles is that when it occurs the whole body of the larynx is buoyed up in the throat, thus tending on the one hand to produce that brilliancy of *timbre* which Garcia says is a characteristic of sounds emanating from a raised larynx, and, on the other hand, to that forward production of voice which is so often insisted upon by singing-masters as essential to beauty of tone. For, as the cricoid cartilage is attached bodily to the top of the windpipe, while the thyroid cartilage is only articulated posteriorly to the cricoid, it will be seen that with every increase in pitch the vocal cords will assume a more slanting position, and thus throw the sound, doubly reflected from the epiglottis and the back of the pharynx, more and more towards the front of the mouth.

Mr. Lunn regards the child's cry as being produced by the same action of the vocal organs as that which I have endeavoured to describe; and he argues, with great force and ingenuity, that it is to the bad influence of the consonants in daily speech that the prevalent false mode of phonation is mainly due. If young children were encouraged to speak and sing with full and free vibration of their vocal chords, and with inflated ventricles, this deterioration would not take place. But when a faulty method has been once acquired, the only way to reinstate the natural action of the organs is to localise the thought and will on the point where the sounds are generated, and this can be most readily effected by practising the "shock of the glottis."

My own belief is that the improvement in tone which

without doubt does often manifest itself during, or in consequence of the practice of syllables beginning with consonants, as recommended by Mr. Curwen and others, is either confined wholly to the supra-laryngeal functions, or results from a partial inflation of the ventricles occurring independently of any consciously directed effort on the part of the singer; and I think that the proximity of the obstruction by which the letter *k* is formed to the seat of vocal tone, renders it less likely to divert the nerve-current from that point than any of the more forward consonants.

It is worthy of note that it is possible to perform tunes of *staccato* sounds with the distended edges of the false cords alone, which thus seem capable of acting somewhat like the percussion action of an harmonium, and to afford the means for that quick and prompt *touch* required in singing such passages as occur in the great song of the "Queen of Night" in the "Zauberflöte."

In conclusion, I must offer one word of apology concerning the title of this paper, for I am afraid you will consider it to be somewhat of a misnomer, since I have said so little about the way in which positively beautiful sounds are formed. I regret very much that I have not been able to proceed further with my subject, but I was compelled to the course which I have pursued by the strongly felt necessity of thoroughly investigating, in the first place, the mechanism involved in the production of tones that are simply *right—i.e.*, formed in accordance with the natural action of the organs, and that has left no time to discuss the, perhaps, more interesting topic. I trust, however, that enough has been said to show how widely the opinions of esteemed teachers differ on fundamental principles, and to demonstrate how absolutely necessary it is that the natural laws underlying this subject should be thoroughly investigated, and that, meanwhile, the practice of our pupils should be conducted in strict conformity with those already known.

DISCUSSION.

The CHAIRMAN said the Society was much indebted to Mr. Steed for bringing before it so large an amount of interesting information. He feared that some of their brother musicians were not very wise in entering into physiology in their teaching. That, of course, did not apply to Garcia; but very often when a musician simply wrote a work on singing, he ventured to give hints on the formation of the throat, and went into subjects which he did not understand. He thought it was rather an

open question whether a knowledge of physiology was really necessary. He should say that, in every case where it was possible to bring the muscles under the power of the will, it must be of great benefit to students to know where and what the muscles were, but he thought it was quite possible that in this case a knowledge of physiology might be looked upon more as an accomplishment than as a necessity. He had been much struck by the remarks on the influence of language upon singing, and there was no doubt a great deal in that. There was often a sort of national tone, and on going into a concert-room you were often able to say at once that a certain singer was a French tenor or a German. That was not universal, especially in first-class artists; but national characteristics were more often found in second-rate singers than in first-rate. That showed the advantage of giving a careful training in the value of the vowel sounds, not only of their own language, but of some language which had the best and purest quality of vowel sounds. Perhaps it was hardly fair to tax musicians with giving worthless hints on physiology, without giving the reason for making this charge. Some of them would remember that a few years ago there was a musician named Dr. Flowers, who had a theory that everybody in the course of his life had a certain amount of chalk formed in the throat, and that if they would use his exercises this chalk would never form to such an extent as to be injurious.

Mr. C. Stephens said he remembered that Dr. Flowers had a large glass case in which he exhibited the pieces of chalk which his pupils had got rid of. He must say that it rather taxed his credulity, and he was not prepared to say where the pieces of chalk came from. He should have been more at home in discussing the paper if Mr. Steed had dealt with touch on the pianoforte, which he had omitted.

The Chairman said he hoped Mr. Steed would give them his remarks on that branch of the subject in another paper. He feared this subject was rather too physiological for the Association to deal with very freely.

Dr. Casson said he had read with a great deal of interest nearly all the works to which Mr. Steed had alluded bearing on the production of the voice; but with his physiological knowledge, slight as it was, of the action of the larynx, he did not think any of those books had thrown much practical light on the advancement of vocalisation. He should say that the production of voice was a thing utterly beyond the control that any physiological knowledge could bring to bear upon it.

The Chairman said perhaps Mr. Steed would be kind enough to say whether he considered this physiological knowledge to be merely an accomplishment, or how far he considered it a necessity. He was bound to say that life was so short that if you could make fine singers without bothering

them about the inside of their throats, it would be an advantage.

Mr. STEED said his position was simply this, that there was a very great amount of bad vocal tone heard in the musical world, and unless you could arrive at some definite principle, so that you could say to a man, "You are singing rightly or wrongly," you really could say nothing to him except, "Sing as I do!" Now it was not always that a teacher could sing very well himself, and, after all, it was not desirable to produce a number of imitators of any singer, however good. It appeared to him it was totally unnecessary for very young pupils to know anything about the ins and outs of this discussion, but he thought that elder ones ought to know enough about the subject to enable them to appreciate the reason of the instructions given by their master. He had himself found a great deal of assistance in speaking to pupils about their tone, when he could say, "You are not singing with a full inflation, and if you put your finger on your throat you will feel whether the larynx is up, and whether the ventricles are dilated." When one could say something definite of that sort it was certainly an advantage. The father of some of his pupils was talking to him about the subject of this paper, and his observation was, that musicians were always running into theories which they could not bring to the test of practice, saying one muscle acts in this way, and one in another; but what was the good of it all? With regard to the production of different registers, he thought they were told a great deal which had no practical bearing on the matter in hand, but when you could get hold of an idea which you could bring to the test of external experiment, you had something which would really enable you to bring your pupils forward more quickly. That, after all, was the great point, and he contended that the possession by the teacher of a knowledge of the true action of the vocal organs must conduce to this end. They did not want their pupils to eclipse a Lind or a Sontag, but to make the best singers out of them in the least possible time. He did think that in all cases a right system should be followed, since nowadays people had not time to devote five years to practising the contents of a single sheet of paper. They wanted results attained more quickly, and, in order to obtain that, they must cause their pupils to localise their thoughts on the place where the sound is produced. If it were proved, as he thought it had been by Dr. Wyllie, that when the ventricles were not dilated the vocal chords had a strain to bear which they were not calculated to bear; if there was a right method and a wrong of producing sound, and if you could make a pupil realise, by external touch or by muscular sensibility, the difference between the right and the wrong, then you had attained something really useful. He was sorry

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there had not been more discussion on this point, because he came as a learner as well as a teacher, as a teacher who hoped always to be a learner. He should like to ask if any member could give him any information on the direct working of the system of voice-training which he believed had been always followed by Dr. Buck, of Norwich. He had been told that his boys were always obliged to vocalise with a closed mouth—in fact, to hum. That appeared rather a curious way of developing the voice, but he had made one or two little experiments with it. He had not trained any pupils upon it, because he did not believe a possible artist was the right sort of body to experiment upon; but he had asked pupils and others to hum through the compass of their voices, and he found generally that they could hum for about two and a half octaves or three octaves without any sensible break whatever. If that were the case, he should be inclined to regard it as a proof that there was not such a very great deal of difference between the various registers of voices as was generally supposed, or, at any rate, that an actual knowledge of the physiology of that matter was not so necessary; but that, as Dr. Streeter taught, after all, the difference of register was more a matter of resonance than of intrinsic difference of production.

Mr. Barry said he went over Dr. Buck's school sometime ago, and saw the apparatus which he made for the use of his boys. It was simply a piece of boxwood with a slit in it, which he put between their teeth, and made them sing through it.

Mr. Stephens said Signor Ferrari used to do the same thing. There was no doubt that Dr. Buck produced some of the best singers known.

The Secretary said he thought there was an important difference between what Mr. Barry described and the apparatus used by Signor Ferrari. That was merely a small block placed in the mouth, but the instrument used by Dr. Buck, according to Mr. Barry's description, was more like a second mouth, with a sort of post-office slit in it.

Mr. Steed said Mr. Barry's information seemed to contradict what he had been told, that Dr. Buck made his boys sing with closed mouths.

The Chairman said he had also heard it stated that he made his boys hum. With regard to opening the mouth, he might remark that Herr George, at Brighton, had invented a little wedge labelled with the various vowels, and with notches in it, so that you might graduate the pupil's mouth according to your idea of what the opening should be.

Mr. Steed said he was sorry he had not been able, in the present paper, to treat upon the influence of the opening of the mouth upon vocal tone; but he did not think it possible for any person, however clever he might be, to produce any two

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vowels, or any two qualities of tone, or different degrees of intensity, or even any difference of pitch, with the mouth in precisely the same position, without the tone being sensibly deteriorated in one way or another. The fact was, the more clever a singer was the more difficult was it to get him to analyse his own sensations. Signor Randegger, in his new book, directed the pupil to sing arpeggios extending over an octave without any movement of the mouth; but he contended that was quite impossible. You must alter the mouth either in shape or size for every modification required.

A vote of thanks to Mr. Steed, proposed by the CHAIRMAN and carried unanimously, closed the proceedings.

February 2, 1880.

OTTO GOLDSCHMIDT, Esq., Vice-President,

In the Chair.

MUSICAL ÆSTHETICS.

By Eustace J. Breakspeare, Esq.

Many writers, nowadays, in treating of any subject, have the greatest difficulty in finding something new to say, so much having been said before them upon almost every variety of theme. In the subject of this paper I am, to some extent, free of this embarrassment; but my task is, I feel, not the less difficult on that account. When I say that writers have not given much attention to the subject of musical æsthetics, I allude more especially to English writers. The Germans have, indeed, busied themselves more than we have in this way, as might, perhaps, be well supposed from the somewhat abstract nature of the subject. But even they have not done so much with the particular branch of æsthetics relating to the musical art as one would have expected. If I myself enter this field, it is not, by any means, that I consider myself one most fitted for the labour; but I do so rather in the hope of inducing those to follow better able than I am to clear the ground of its difficulties.

The reason of this assumed want of attention may be that artists, and particularly English artists, are, as a rule, impatient of any art-teaching of a non-practical kind; or, if theoretical, any such that does not bear directly upon the practice of their art. They are inclined to regard, with some feeling of disgust perhaps, all art-philosophising, and especially if such comes from any not much acquainted with the technical side of art. This, of course, will not be taken as imputing any blame to the artist; for if we consider how very little a certain class of art-literature can possibly influence or affect art-practice—how much of this writing is, in fact, nothing but sheer verbiage—we can scarcely be surprised at the readiness of the true workman in art to let the philosophers have the game all to themselves. The English artist must always have clearly before him the realisable object and outcome of his labour; any sentimental vapouring over the tendency or mission of art in the abstract becomes insufferable

to him. He relies upon his own instinct to lead him aright; he prides himself upon knowing his work and doing it without the need of guidance, except that purely academical. Even where the art-teaching is of too sound, sincere, and thorough a kind to be so ignored, he will be careful to abstract what will afford him practical nourishment from what he will likely regard as mere poetical fine-writing. But, nevertheless, there must be certain laws of art—followed unconsciously, perhaps, by the artist—according to which, in forming our taste and increasing our knowledge in art matters, we must judge all works. Even if the artist be allowed to work independent of rule—and we know very well practice has always preceded theory—some enlightenment as to the nature, aim, and capabilities of any art will be required, at least by the lay-follower of the same. The want of some well-grounded and generally adopted philosophy of the musical art is, at the present time, most evident.

What I propose doing here is to pass in review certain opposing theories already put forward, and I can pretend to do little more than give a fair presentation of these. The application of the word "æsthetic" is at times very wide, and at other times very narrow. Some employ it in a sort of adjective sense, to denote generally whatever may appeal to a cultivated and refined taste; while others use it in connection with the stricter forms or the purely sensuous elements of art. Properly, according to its Greek derivation, æsthetics should be the science dealing with sensation or perception. The word itself does not indicate what sensations, if not all, are implied; but it is to be understood that they are those said to be of a beautiful nature, or which have for their exciting cause objects possessing certain properties which render them capable of impressing agreeably, in particular ways, the mind or sense. To æsthetics, then, is committed the task of determining these properties, and the relationship between the objects of beauty and the changes in the condition of the mind which accompany the perception of these: the more restricted meaning of æsthetics being, then, *the science of the beautiful*. Æsthetics, besides dealing with general ideas of the beautiful, must show how far the beautiful manifested in nature's work is capable of being followed out by the artist in *his* work, each department of art requiring here separate treatment. The æsthetic objects are properly those perceptible by the eye or the ear; and besides having certain qualities of colour, form, and tone, immediately gratifying to these organs, must be so presented as to satisfy our more intellectual sense of and requirement for unity, symmetry, proportion, and variation. With the establishment of these conditions for the work of art, and the inquiry into their fulfilment, æsthetics, as a science of the beautiful in art, is generally accounted complete. But

it has never been universally agreed that beauty exists altogether as an intrinsic and independent property of the object itself: some considering that only certain states of feeling or mental moods are to be considered primarily; and that an outward object can only be designated "beautiful" in so far as it accords or is associated with these same. No wonder, then, that, entangled at the outset in metaphysical difficulties, the work of establishing some definite code of æsthetic laws for so subtle an art as that of music should not have advanced very rapidly.

Although, from Plato and Aristotle downwards, the subject of beauty had been often enough discussed, the first to elevate æsthetics, under this name, into a distinct science, was the German Baumgarten, a disciple of the philosophers Wolf and Leibnitz, whose work on the subject was published in 1750. Having to do with beauty, which he defines as "the perfection of sensuous knowledge"—that which we gain through obscure perceptions—æsthetics is distinguished from logic, which, aiming at the establishment of positive truth, deals only with clear conceptions; and from ethics, which latter, seeking to arrive at the knowledge of perfect goodness, has for its study the manifestations of the desires and the will.

Sulzer, a follower of Baumgarten, made an extended survey of the æsthetic details of the several arts. His work, however, has somewhat the disadvantage of being arranged in lexicon form. He is indebted, too, to Kirnberger for many of his ideas respecting the musical art. Sulzer, after having first laid down that the chief aim of art is to put into play certain feelings or dispositions of the soul, assigns to æsthetics the task of inquiring into the origin of these feelings; of determining the precise nature of the æsthetic objects, and the conditions under which they must be submitted to our perceptions; and the exact situation of mind in which we are best able to receive their influence. Æsthetic material in general presents itself, according to him, under three different aspects, making an agreeable impression upon us in so many ways. Either it appeals to our understanding through its approach to perfection or adaptation to certain ends, or it appeals to our imagination through the senses, or it pleases us by a sense of its moral worth or power of beneficial application. Sulzer illustrates by a diamond the union of these three elements. In its hardness and indestructibility it may be taken as representative of that class of things which please in corresponding to our idea of perfection; by its brilliancy it gratifies our bodily sense and stimulates our imagination; and its monetary value may stand for that quality of goodness in a thing which pleases without respect to its form, or material, or utilitarian aim. The æsthetic object, to be accounted beautiful, must be clear to comprehend; it must have manifold but orderly variety

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of parts; and unity in the whole must prevent any of these parts becoming too obtrusive. Sulzer would not have it that the work of art were its own end: it must serve some higher moral purpose. He says it does nothing to startle a man by a sudden cry, as if some great misfortune had happened, but to awaken in him horror over a crime committed is something of much greater importance. It remained for Schiller to decide that, though art was certainly moral in its tendencies, its moral application was not the very first subject for consideration. Music, according to Sulzer, was especially the art most suitably employed as a disciplinal force or pedagogic aid.

Instead of carrying out their programmes fully, German writers on æsthetics mostly occupied themselves with the general theory of beauty. Those, indeed, who treated of the separate arts took up some particular branch: as Winckelmann, who made known the principles of Greek sculpture; and Lessing, who, in his "Laocoon," marks clearly the boundary between poetry and painting. Those philosophers who touched upon music in their general treatment, such as Kant, Herder, Goethe, were, no doubt from want of practical conversance with the subject, far from establishing any sound basis for musical æsthetics. The matter is, again, by some treated very superficially, music being regarded as consisting in little more than a sensuously gratifying succession of sounds; or, on the other hand—the writers having, likely, Saul and David in their mind's eye—looked upon as a curative means for mental and even bodily ailments. The works of Forkel, Engel, Kirnberger, among others, may be mentioned with greater respect; but these writers do not put forward any complete system.

The one, indeed, who may be said to have written the first complete treatise on the subject was Professor Hand, of Jena, who published the first volume of his "Aesthetik der Tonkunst" in 1837. The author's views are logically and philosophically propounded, though the writing, to an English reader perhaps, has hardly that clearness that might be desired. Hand, following the lines of Baumgarten and Sulzer, recognises the division of æsthetics into a general theory of the beautiful, and a special æsthetic for each province of art. Musical æsthetics, as the philosophy of the beautiful in music, being distinct from acoustics, which concerns the natural laws of sound; and from harmony, relating to the grammatical combination of musical tones.

Hand does not occupy us long in the discussion of the beautiful in the abstract. He goes upon the assumption that we form in our minds the idea of beauty to which we refer all outward appearances. He says that "as we have now the beautiful in us, and the object has only the property to excite this feeling of the beautiful in our inner nature . . . we

bear within us the oracle to be questioned, that may solve any outer problem." In a stricter sense, the beautiful, he tells us, may be said to exist only within the range of perceptible forms, but only in so far as the object is the free expression of some spiritual activity. The thing which excites in us the feeling of the beautiful may itself very readily be mistaken for and accounted as the beautiful; but the beautiful is truly that of which this is but the expression.

As respects the musical art, outward nature, according to Hand, gives man little for imitation; she but presents him with his working materials. Music, properly understood, being the expression of some free intellectual nature, the song of birds, while obeying some blind instinctive impulse, or the sounds of inanimate nature, cannot strictly come under this designation. The music of man he characterises as follows: in the first place it is, as just remarked, purely his independent product, as shown in the arrangement of the sounds nature gives him—the formation of his scales, the grouping of his harmonies, the establishment of his rhythm—all of which is quite arbitrary on his part; in the next place, his music is the direct outcome and expression of his spiritual condition; and lastly, through his music, the emotional nature is not only interested, but the whole range of his intellectual or reflective faculties is called into exertion.

The beautiful in music, as the expression of this free activity, may show itself in the harmonious relationship of the parts of a work, the logical sequence of tones, and the changeful and well-regulated harmonies: this constituting formal beauty. Then, as every individual has some characteristic mode of expression, music through the diversified changes of harmony, rhythm, tempo, tonality, &c., may depict the various shades of inner feeling: thus characteristic beauty is shown. But in certain music we are called altogether into a new world of ideas, and are reminded of things higher and more spiritual than ourselves: here the characteristic becomes allegoric. In such music we have present what is termed ideal beauty. According to the part these elements of beauty take in the musical work a classification of distinct styles may be made. On the one hand we have those which please more by their agreeable form of presentation, such as the charming, naïve, graceful; then, again, those appealing to sentiments of a wider reach, as the sentimental, noble, pathetic, grandiose, and sublime; and again, those wherein the conflict between human freedom and necessity is touched upon, as in the sorrowful and the tragic; other styles, as the romantic and the humorous, being formed from time to time.

Hand's work has been generally recognised in Germany; and the little English work on the subject, by Mr. Pauer, is based on Hand's method. But I come now to speak of a

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work which aims at a thorough subversion of the popularly held tenets of musical philosophy. This is an essay by Dr. Edouard Hanslick, the well-known art-critic of Vienna ("Vom musikalisch-Schönen: ein Beitrag zur Revision der Aesthetik der Tonkunst"), which has undergone a translation into French, but not, as far as I am aware, yet been introduced to English readers.

Hanslick complains at the outset of writers on musical æsthetics having busied themselves in attempting to discover what feelings are aroused by music, or how feelings may be expressed by music, rather than with any sound inquiry into the positive nature of the beautiful in music. He condemns their efforts as unphilosophical, and their teaching as productive of nothing but a false sentimentality, which, however gratifying to certain minds, offers little real enlightenment to the earnest student. A more scientific method, and one better suited to the spirit of the age, he thinks, ought rather to be followed. Instead of commencing with the subjective impressions created by the work, we can proceed properly only by learning to examine the thing more in itself—getting to see what it really is apart from the thousand-fold changes of impression it may produce. Poetry and the plastic arts, he asserts, are far ahead of music in this respect. Connoisseurs have, for the most part, abandoned the notion of adapting a general æsthetic principle to each and all of the arts. The laws of each individual art are dependent upon the peculiarities of its material and its technic. The object of beauty and not the sentient subject must occupy us in æsthetical investigation. We have been taught that since music cannot, like poetry, appeal to the understanding through ideas, nor, like painting, through concrete forms to the eye, its mission must hence be to work upon the feelings of man. But wherein lies the connection between music and the feelings—between certain musical forms and certain distinct conditions of the mind or soul; after what laws of nature the effect is produced; according to what rules of art the work, to have always the required effect, should be constructed—we are left altogether in the dark. The feelings are here called upon to play a double *rôle*. In the first place music is said to have for its aim the awakening of the emotions; and, in the next place, the emotions are said to form the subject-matter of the artist's work. A thing that is beautiful in itself, says Hanslick, remains such even if it should excite no emotion, or if even it should never be examined or inspected; it may be produced for our gratification, but does not gain its quality by virtue of the share we take in it. Hanslick goes on to distinguish between perception (*Empfindung*) and feeling or emotion (*Gefühl*): we are *percipient* of the scent, colour, taste of a thing; if joy, melancholy, hope or hatred take us out of our normal state, we are

said, in ordinary language, *to feel*. The elements of beauty must, at first, be received through the senses; but, according to common thinking, music should dispose us to feelings of reverence, love, regret, and so forth. But the faculty with which Hanslick would have us regard a work of art is that which he terms the *Fantasie*, or fancy, and the attitude of mind that of pure contemplation (*reine Anschauung*).

So far as I can gather the author's meaning this contemplative attitude is to be understood as the attentive observation of the changes and manifold combinations of tonal forms, heightened by the pleasurable participation of certain of the intellectual faculties. Although Hanslick says that æsthetic laws must be based upon the peculiarities of the especial art, he cannot resist making a side-reference to other arts than music to illustrate his argument. To what architect, he asks, has it ever occurred that the purpose of his building was to excite certain feelings in the mind of the beholder? The feelings in relation to an art-work afford rather a subject for psychological than æsthetical investigation. As Hegel remarks: "What is felt, remains concealed in the form of abstract, individual subjectivity; and, therefore, the distinctions of this feeling are, likewise, quite abstract, and no distinctions of the thing itself." Hanslick asserts that there is no universal and necessary connection between the work and the emotion raised by it. The same piece may work very differently upon different people, not greatly dissimilar even in point of age, temperament, nationality, or condition. Some find their utmost pleasure in listening to a cantata of Bach or one of the last quartets of Beethoven, whilst others would be altogether unmoved thereby. It must be noticed that Hanslick does not deny the power of music to create emotion: he speaks of music's capability to rouse the stronger passions, and of the soft, tender moods into which she is able to lull her votaries. He declaims simply against what he considers the unscientific adoption of this property of music, as forming part of æsthetic study. Joyfulness and sadness, he remarks, can certainly be called forth by means of music; but not in a greater degree than through the fortunate winning of a lottery prize, or the news of the death of some one dear to us. But so long as one cannot class such things as lottery-tickets or physician's bulletins with a symphony or an overture, so, he thinks, one cannot treat factitious emotion as constituting an æsthetic speciality of music or any particular musical work. As regards the subject-matter or contents (*Inhalt*) of any other art than that of music, we can generally denote this in words, or make referable to distinct ideas. We can say, for instance, such a picture represents a flower-girl, such a piece of sculpture a gladiator, such a poem a deed of Roland. The more or less complete realisation

of these ideas, according to the materials at the artist's command, decides us as to the beauty of the work. But the feelings do not stand severally so isolated in the soul that they can be depicted by an art incapable of conveying other activities of the mind. To understand what the exact emotion is, we should be acquainted with the precise notions or mental conceptions occasioning it. Hope, for example, is inseparable from the idea of a happier condition; love is associated with the thought of some adored individual; melancholy is induced by the comparison of past happiness with the present. Take away these generating ideas, and the feeling without them can scarcely be designated that of hope or anything else in particular; nothing but the feeling of vague satisfaction or uneasiness remains. We may associate in our minds the colour red with the sentiment of joy, or white with the idea of innocence; the key of B minor may be taken as symbolical of misanthropy; satisfaction may be supposed to dwell in the chord of C, or rage and despair in that of the diminished seventh. But, according to our author, this is altogether our own fanciful interpretation; the colour or tone cannot strictly be said to convey these notions. There are many works, Hanslick remarks—and he instances the "48" of Bach—which are admitted not to have much to do in the way of exciting or bespeaking emotion. So, he declares, to support a theory, the whole range of figural music must be ignored. Or, he says again, let a theme from a symphony of Mozart or Haydn, or from an adagio of Beethoven, a scherzo of Mendelssohn, a pianoforte work of Schumann or Chopin, be played, or even some popular overture-motive of Auber, Donizetti, or Flotow;—if it now be asked what is the particular sentiment of the strain, the most widely different interpretations may be expected. Can this, he asks, be the true expression of a definite emotion when no one can tell clearly what is intended to be expressed? Hanslick restricts his observations to purely instrumental music. He considers that a union of music with poetry may increase the power of music, but does not extend its bounds. What *instrumental* music cannot perform, it should never be said that *music* can do.

After being informed what the beautiful in music is *not*, we are led to regard what it is positively. Hanslick characterises it as *specifically musical*. There can be no subject-matter but that of the musical tones themselves, in an artistic combination. An illustration is afforded us by the arabesque ornamentation in painting, or by the changeful forms and colours of the kaleidoscope—only that the forms of the tonal kaleidoscope emanate from a creative mind, while the others are but those of an ingenious mechanical toy. So the composer's work is altogether of an objective nature. Not the desire to express some personal emotion, asserts Hanslick, prompts the composer,

but that rather to invent some original and specifically musical strain. A piece might seem to us to sound proudly or sadly; but we should be wrong to assume that the composer necessarily felt proud or sad at the moment of composition. But, strangely enough, what he denies to the composer, he allows to the executant of the work. He grants to the performer the power of making his emotional nature manifest, faithfulness towards the composer's notes only being required. He says that though a musical box may not move its listeners, yet the most unpretentious vocalist may, when he sings with his whole heart and soul. Hanslick then considers the nature of emotion roused by music. That music directly affects the nervous organisation is, of course, a physiological fact; but no satisfactory account has yet been given of the relation of the physiological sensation to the resulting psychological process, of the exact manner in which nervous changes are followed by corresponding changes in the state of the mind or spirit. Acoustical science, especially with the light of Helmholtz's researches, can explain why one sound should appear shrill or repulsive, another clear and pleasing. But how should certain successions of tones equally consonant in themselves arouse so many distinct sentiments of the soul? And here is Hanslick's stand. While one cannot clearly show the relationship between psychological changes and the varied phenomena of sound, neither can one base scientifically a theory of the beautiful upon the uncertain effects of the latter. The ordinary listener enjoys music in the passive reception of its sensuous elements. His relation towards music is not introspective, but "pathological." A fine cigar, a delicious meal, or a luxurious bath affords him the same species of gratification. The true musical listener, however, attends more to the structure of the composition, noting what, in this respect, distinguishes it from any other musical work. Upon savages, music exerts a more direct emotional influence than it does upon cultivated people. With cultivation the listener loses taste for the rude elements of art. Hanslick is led then to the conclusion that it is the artist who feels least. The man of sentiment inquires whether a piece be joyful or sad; the musician, on the other hand, whether it be good or bad. He sets, in opposition to what he understands as the true way of hearing music, the rough emotion of the savage in the same class with the dreamy intoxication of the musical sentimentalist.

The first objection to Hanslick's views is to be made with respect to the too definite ideas he attaches to the emotion expressed or induced by music. This cannot be said not to be sufficiently precise or clear because its meaning cannot be conveyed by words. When he says that the connection between certain music and certain feelings is not always a necessary

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one, and that a piece may move some to tears while it may leave others cold, or a thousand circumstances alter its effects upon the same person, this proves nothing but that for the proper reception of a work a certain susceptibility and knowledge on the part of the listener is demanded, which is not possessed by all, and that it should be heard under fitting conditions. Even to accept Hanslick's narrow view of the beautiful, the elements of beauty which please universally are but very few. They may be restricted to certain colours, forms, and tones of a limited number. And because emotion caused by real events cannot come under æsthetic rule, we are not to allow a place in art-philosophy to factitious feeling! It has long ago been established that upon imitation and illusion the whole being of art centres. The emotion raised by the power of art is distinct from that brought about by things of reality. It may, perhaps, be said to be the imaginative revival of *past* emotions which art induces. According to an English writer, to whom I have to refer, the emotions in art are *ideally excited*. Lobe, in his criticism of this essay, says that not our opinion as to the beauty, but simply as to the *truth* of the artist's representation, is formed according to the degree in which his idea is embodied in perceptible form—that which we generally consider as beauty residing more in the formal treatment than in the subject. He quotes a passage of Schiller, which I render as follows: "Many I find go wrong in so far that they make the idea of beauty relate too much to the matter of the work rather than to the handling of the same. So must they be somewhat at a loss when they would comprise under this idea of beauty the Vatican "Apollo" and other forms of beautiful exterior with the "Laocoon," a faun, or any other painful and ignoble representations. It is the same with poetry. People have ever perplexed themselves in the attempt to reconcile the rough, often low and repulsive characters in Homer and the tragic poets with ideas formed of the Greek beauty. Would that one might venture to put aside the idea of beauty, and even the word itself, with which all these false notions are inseverably connected, and set in its place the word truth."

Although some works may be of a more formal character than others, yet a piece, so long as it is music in any sense, must have some emotional colouring, even if, as Ambros remarks, "it only expresses the feeling of *ennui*"; and as Lobe again very smartly puts it, even if forty-eight men were shown to be utterly devoid of emotion, it does not follow that all men should be so likewise. Hanslick's kaleidoscopic notion has been taken up by a French writer, Charles Beauquier, author of "Philosophie de la Musique." It may be very attractive to some minds; but I would compare the Hanslickian auditor to one who would remain untouched through-

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out the performance of some dramatic work, who would not submit himself to the illusion of the piece, but would content himself with criticising the performance, or in watching the ingenious development of the plot. A poor story would be to such an one as good as a Shakespearian tragedy, provided it were constructed after certain rules. If emotional effects are not to be considered at all, why should, say, a change from a grave strain in a minor key to a jilting reel, or a monotonous succession of movements all in the same key and style, be regarded as æsthetically wrong? Nothing could be said against them, at any rate, on Hanslick's ground. So long as people believe that they discover something more than mere tone-play in a composition, and while certain effects are undeniably present, the philosophy of the art, to be complete, ought to take *some* notice of this.

With respect to the "pathological" argument, Hanslick overlooks the fact that the ear and the eye are distinguished from the other organs as pre-eminently the æsthetic *media*. I cannot do better than quote the following passage from one of the philosophical essays of Dugald Stewart: "To the foregoing considerations, however, I must not omit to add, as a cause conspiring very powerfully to the same end, the intimate association which, in our apprehensions, is formed between the eye and the ear, as the great inlets of our acquired knowledge; as the only *media* by which different minds can communicate together; and as the organs by which we receive from the material world the two classes of pleasures which, while they surpass all the rest in variety and in duration, are the most completely removed from animal indulgence, and the most nearly allied to the enjoyments of the intellect. The unconsciousness we have, in both these senses, of any local impression on our bodily frame may, perhaps, help to explain the peculiar facility with which their perceptions blend themselves with other pleasures of a rank still nobler and more refined." Though we may not be able to explain how every sensation engendered by sound resolves itself into a particular state of mental feeling, still the true artist knows with certainty what will convey his intention, and the listener, if his art-sense be sufficiently cultivated, recognises the fitness of the means to the end in view. And there should be some state midway between that of the emotional savage or the sentimental dreamer and that of Hanslick's ideal listener. We arrive at such when we can regard the work with critical appreciation of its form, design, and so forth, and at the same time share also in its emotional contents. One would think, too, that the most highly cultivated listener, according to Hanslick's definition, and the one most impregnable to emotional influence, could not help, to a certain extent, being *nervously* affected by

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musical tone. But the author is led into many other inconsistencies in his desire to regard the work of musical art as something purely objective. Whether his remark be true, that the artist is the one that feels least of all, I will leave to your own judgment. I can simply give another sentence from the author I have just quoted. "Objects of whatever kind," says Stewart, "which please the connoisseur alone, prove only that there is something fundamentally wrong in the principles upon which he judges."

I have now just to notice briefly a recent work on æsthetics, by a French writer, Eugène Véron. Instead of attempting to construct a theory of the beautiful, *à priori*, Véron commences by taking a glance at the development of the art-faculty in man. However far we look back in the history of mankind we find some tokens of art of however rude a kind. Art is not, then, altogether the outgrowth of an after-civilisation, but the spontaneous manifestation of that superior intellectual activity which distinguishes man from the lower animals. Speech and writing owe their origin to man's instinct of imitation. It is not very difficult to believe that the sounds heard by primitive man should have produced certain impressions upon him, and that he should have been led to denote the latter by sounds more or less resembling their immediate causes. Thoughts, always concrete, expressed themselves through tokens, whether in picture or tone, in the exact order in which they were disposed in the mind, the spectator or listener determining as best he could the relationship between them. But there comes the need for greater precision and clearness in the expression of his ideas. Better to correspond with the new state of intelligence, other modes of expression have to be sought. These can only be found in signs purely conventional. Then, by opposition, the concrete and personal impressions come to constitute the domain proper of the pictorial and musical arts. Art, in disengaging itself from the faculties purely logical and intellectual, becomes more clearly defined, accentuated, and extended. It is no longer a necessity, but a play, having for its principal aim the interest of the sensations and sentiments by means of images and sounds. Man, being moreover essentially a sympathetic entity, can rejoice or grieve over the sorrows or pleasures of others as well as his own; and, besides, his power of imagination enables him to arrange fictitious events and present them to himself under colours even more striking and vivid than those of reality. To this may be added the admiration he has for the skill of the artist shown in any work of art. In modern art, too, the man is inseparable from the work; and we value the work, to a great extent, according to the measure in which the artist's individuality in it is declared. All this, combined with the gratification afforded to the ear and eye by a well-ordered display of

colours, tones, or forms, makes up the æsthetic delight. As such little precision is attached to the word beauty, Véron would discard it, and giving a wider application to the term, define æsthetics as "the science having for its object the study of the manifestations of artistic genius."

When considering the musical art separately, Véron refers to the opinions expressed by our own English writer, Mr. Herbert Spencer. The latter, in his essay on "The Origin and Function of Music," seeks to show how distinctions in vocal sound are physiologically resulting from changes of feeling or emotion. We are so accustomed to find a certain state of feeling always expressing itself in certain cries, accents, or tones, that at last the feeling and its mode of utterance become so associated in our minds, we no longer hear the sound without the allied feeling being recalled. In vocal music we find this emotional expression carried to its utmost extent. And the significance of musical sounds generally, with all their variations in pitch, *timbre*, force, interval, he takes to proceed altogether from this relation between emotion and its ordinary manifestation. And, moreover, other sentiments and moods, far more unusual, subtle, and complex than the simple emotion, arise; for which, however, the musician, more susceptible to these than the generality, finds the proper mode of utterance.

These theories may appear, in themselves, insufficient and probably too speculative. But if they can be supported, a better ground for some æsthetic system will be afforded than Hanslick's theory, at any rate, could give us. If musical ideas could be shown to follow some natural law of expression, and some higher significance be shown to exist in their connection and general disposal, it were better than to regard them as only appealing to the interest of the ear through a certain skilful arrangement of elements and forms. Hanslick's work has been said to have opened a new era in art-criticism: it has certainly induced writers to examine a little more carefully the boundaries and capabilities of the musical art; it has put an end to the fanciful notions of such writers as Mattheson and Schubart, who give recipes, as they may be termed, for producing such and such musical effects. There are people, too, who think more about the "tale" attached, perhaps, to some piece than about the music itself. If these can be led to study rather the "architecture" of a composition—its formal structure and development—so much the better. But certain German writers on musical æsthetics have of late gone perhaps too much to an extreme. Taking up what I may call the positive side of musical philosophy, they have so narrowed the subject as to make it relate to little beyond the study of the physiological sensations of tone. Whatever advance musical knowledge may make through them, it is to be doubted whether

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the field of æsthetic inquiry is strictly of so limited an area. Though, to my mind, Hanslick's work is very unsatisfactory, still the amount of interest it has excited elsewhere, though little known in England, I thought might warrant me in discussing it in this place. I will only say, in concluding, that I can fancy nothing more likely to bring about ineffective and unenduring work than for a composer to take up Hanslick's theory, and fashion his ideas as far as he can in imitation of a kaleidoscopic display.

DISCUSSION.

The CHAIRMAN having invited remarks on the paper,

Dr. STAINER said he could only speak with diffidence on so very wide a subject as musical æsthetics, but having given some attention to subjects surrounding and connected with it, he had come to the conclusion that nothing would ever be really done with it, or at all events that it would never be properly dealt with, until it should be approached as a subject to be studied philosophically, because the moment the question of musical æsthetics was considered it would be found drifting into one or other of two views. One view was that the idealism apparently existing in nature must also be recognised as relating to subjects of art, and in taking up the subject of æsthetics, it was considered by many that the sense of beauty was but the reflection of the beauty of the Deity. In this view a musician was just as much a prophet as the prophets of old, only that he wrote his prophecies in sounds instead of in words; and those holding that view considered that the possessor of musical genius was the possessor of that fortunate correlation of art with nature. The modern idealist did not desire to advocate the idea that there existed an ideal of everything in the universe, as was held by the Platonists; but they to some extent coincided with the old notion of idealism, because if our ideas of the beautiful were derived from direct intercourse with the Deity, they could only be obtained from something existing in the Deity, and must therefore have had an eternal existence, and so far they coincided with the idealism of the Platonic school. Then by the other school they would find themselves taken in an opposite direction by their authors, notably by that of Véron, whose book was no doubt of great value, although really there was very little about music in it; but those who were at all afraid of having their ideas as to the very foundation of music dug away from under their feet, had better perhaps avoid it. It commenced by tracing back all ideas of the beautiful and of justice, or whatever was right or wrong, to the outgrowth of men's own views

of what was practically either "nice," which was pure sensationalism, or what was simply useful, which was one of the results of the socialistic view. In taking that view of art, writers of that school asked people to believe that men in themselves possessed the germs of the very highest art, which certainly must be allowed to be true, looking at the history of humanity, and which in music was simply giving expression to the high faculties which had not hitherto appeared in the world, perhaps because people had not yet been educated up to them. But that view of the matter was purely subjective, and the school of idealists holding it really made the question subjective, not objective, so that in their expressions with regard to the excellence of the work being in the man only, they naturally always alluded to the work of the man being the important factor in a work of art. In that way people would find themselves driven either to be idealists or materialists—not a very pleasant choice; but he thought there was, after all, a middle course between them, and would venture to state it, however unpopular middle courses were in these days. It was not a compromise exactly, but still he did not see why their ideas of the beautiful in art should not possess something of both views, first, that those ideas did exist in the Divine mind—all Christians must say that—and also that men had faculties given them to work out, so that in time they should be able to appreciate that Divine beauty and to express it. Such a view seemed to be the only reasonable one, because it embodied the best points of idealism without reducing people to an absurd extreme, while it partook of materialism by making men to a certain extent the authors of their own future in art. That middle view, therefore, between the two extremes seemed the only satisfactory one. So much for the philosophical side of the question. Then as regarded the criticism of music as an art. That was assailed from two very opposite sides almost as divergent as the two philosophical views of the origin of music. Musicians claimed for music that one of its greatest virtues was that it was so indefinite. When he was told, in sitting down to a composition, that such and such a thing had a definite representation he rebelled against it, and would prefer not to be told so, but to be left to himself to interpret his music in whatever way he chose. Another school of art-critics had gone in an exactly opposite direction, and had treated the subject as an art in itself. The question was really whether the indefinite nature of music elevated or diminished its character as an art, and his own opinion was that it elevated the art of music. In the highest works of art in other spheres, for instance, the best schools of painting seemed to aim not at entire realisation, but merely as it were to unlock in the mind higher trains of thought; and such productions should be considered as far higher works of art than those which followed

the pre-Raphaelite schools. All art should therefore be valued according to its power, not of calling up a definite set of emotions, but rather, so to speak, of setting them going. He valued a musical work, a symphony of Beethoven or of Mozart, not only in itself, but for putting him in a certain frame of mind; and they all, probably, after hearing a fine piece of music, would prefer to be left alone until the effect it had produced upon them wore off. With those who called that a defect in music he could not agree; he thought, on the contrary, that it was a source of great beauty. Another point was the arbitrary character of the laws of musical art. A vast amount of mischief had been done to art by holding that its laws must be exact. Could anything, he would ask, be less a work of art than the Multiplication Table? But, as people's education improved, and as the nation worked on and humanity at large progressed, there must necessarily be a shifting standard in every sphere of thought, in religion and philosophy as well as in art; and therefore to say that the laws of music must necessarily be exact was fallacious and wrong. Another matter to which he would allude was the curious mixture, in very great and sublime works in music, of something intended to be funny or odd—a fact no less striking in musical works than in the plays of Shakespeare. In Beethoven's music there was often something which excited surprise or laughter, though on the whole the work would perhaps evoke a religious feeling or emotions of awe. So it was in some of the most sublime passages of Shakespeare, where a funny fellow would be introduced to set the theatre in a roar. In fact, such antitheses seemed almost a law of nature, and certainly people could see and appreciate the ridiculous more clearly when set against a background of the sublime. Such contrasts were of universal occurrence, as, for instance, in courts of law, where, while some poor creature might be on trial for his life, the most abominably poor pun would set the court roaring with laughter. Doubtless the absurd and the ridiculous present themselves more vividly when standing out on a background of deeper thought. As regarded Dr. Hanslick's recommendation that people should study æsthetics of music deeply in order to get better ideas of its effect, he must disagree, for the æsthetic or emotional effect of a piece of music was exactly the result of what the composer put into it. Emotions passed through the mind of a being very delicately organised like a composer which would enable him to write pieces appealing variously to the feelings; but he thought that to study or look for those feelings in the actual piece of music itself was illusory, because they could only be extracted from the music by a sympathetic performer. Really no music could give musicians so much pleasure as that which was so rendered as to present a reflec-

tion of the composer's mind. Take Schumann's music. Whatever faults he might have as an artist in putting his works together, he always communicated the feelings with which he wrote. So it was, too, with Schubert; and therefore it seemed that Dr. Hanslick really upset his own argument for the study of the cause in the subject itself, because the ideas he expressed seemed to be against it. Many of them had heard pieces of music not really very excellent made most interesting by a fine performer, which made it clear that if the performer gave greater feeling than was expressed by the composer the performer could, if the music permitted, give more than appeared in the music itself. He would strongly recommend anybody who wanted to deal with this subject of æsthetica to set about it in a philosophical way, and to begin with the study of philosophy, in order to judge between the two courses in which they were led—one set of people saying that beauty in art came from God, the others that it comes from men alone, because that was really what it amounted to —and unless they so studied the subject they would find they could not do anything with it. The authors so mixed up those ideas that, before people could get any pleasure from such work, they would find that the subject must be placed on a purely philosophic basis. A good book on the subject was very much wanted indeed.

Mr. PROUT, with regard to the remarks of Dr. Stainer, as to the indefinite character and expression of music, recalled a very apt saying of Richard Wagner's, in one of his works, that "just where speech ends music begins."

Mr. BREAKSPEARE: It was said before Wagner's time: he simply quoted the phrase.

Mr. PROUT believed that was so, and said he thought the quotation appeared in his "Music of the Future." Nothing appeared more absurd than the style of criticism, if it could be called so—perhaps it should rather be called the style of rhapsodising—which strove to attach definite ideas to every composition except where the music was allied to words, or in the case of such a work as Beethoven's "Pastoral Symphony," in which a guide was given as to what the music was intended to be, and was more truly a description of the emotions than could be conveyed by a painting. He had been brought a good deal in contact with musical literature, and had at the present time a book awaiting review dealing with some standard works in that stupid rhapsodical manner. It was in fact the recollection of that book which brought the matter vividly before his mind when he heard Dr. Stainer's remark. Unfortunately that book was by no means a solitary instance, and a protest ought to be made against that sort of thing passing for criticism at all.

Mr. BREAKSPEARE said that any remarks he had made must

be received as having been advanced by him in a tentative way. It seemed to him that musical philosophy, to be complete, must regard both the emotional and the formal sides of art. As Véron had said, musical impressions might be compared to water which escaped from the hand when an attempt was made to hold it, but the existence of the water could not be denied. It was difficult to attempt to minutely classify and arrange the effects of music, but however difficult it might be to do so, there were many sorts and styles of music between the joyful and the sad which could be arranged in a definite manner.

The CHAIRMAN, after Dr. Stainer's very elaborate remarks, would only give a few explanations, perhaps necessitated by the use, in one of the writers referred to, of the German term *reine Anschauung*.

Mr. BREAKSPEARE said the phrase was one most difficult to render in English, but he had translated it as "pure contemplation."

The CHAIRMAN said the phrase comprised the subject in a nutshell, and it might very well be rendered as abstract consideration or contemplation. The term, as used by Schiller and other art philosophers, meant the abstract contemplation of works of art; and he thought, as the whole subject had been put forward by Hanslick, that it should be dealt with by regarding works of art as pure abstractions, not dealing with the emotions at all. Reference had been made by the reader of the paper to the similarity of effect produced upon, say two people, by a cantata of Bach or a symphony of Beethoven.

Mr. BREAKSPEARE explained that this remark applied to music generally, with regard to the fact that the same piece would produce varied effects upon different minds.

The CHAIRMAN said the matter was one of training. Take a boy of sixteen, who had not been trained to appreciate high works of art; he might prefer, to a grand posthumous work of Beethoven, some jolly music of Offenbach. There could be no doubt that productions like a posthumous work of Beethoven, or a cantata of Bach, required a very different preparation for understanding them to that necessary for appreciating a rollicking march or a valse. It was there, in reference to the emotional effect of music, that he thought Dr. Hanslick wrong.

Mr. BREAKSPEARE explained that Dr. Hanslick's idea was that the emotion of the savage and that of the emotional musician of the present day were much of the same character, and that in reference to beauty in art we should throw aside the idea of emotion altogether.

The CHAIRMAN mentioned that he had lately seen the report of a Civil Commissioner to the Colonial Office on some native tribes in South America, in which reference was made to their

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music. A melody there given, it was said, had such an effect upon them, that as soon as it was heard in or about one of their villages it would bring all the people together. In fact the melody appeared to be their acme of music, but he had looked it through, and really there was neither melody nor tune in it; and if that was the system of Dr. Hanslick for deciding the beauty of music, probably no more time need be spent in discussing it. In the main, he fully agreed with Dr. Stainer, and he could not understand why the art-writers could have such difficulty in construing the works of a composer, because surely they must participate to some extent in the gift which he himself possessed. He would in this connection refer to Turner's saying, that genius was nothing without "work, work, work," and suggest that it was the combination of genius and work which made great composers. To refrain from applying that principle to such composers as Mendelssohn, Bach, or Beethoven might be very well for people who knew nothing about it, but those who had worked in however humble a way would know that the musician could do but little with either alone, but must possess the capacity for both combined. In conclusion, he proposed a vote of thanks for the excellent paper which had been read by Mr. Breakspeare.

The vote was seconded and carried unanimously, and with a similar vote to the Chairman the meeting adjourned.

MARCH 1, 1880.

C. K. SALAMAN, ESQ., VICE-PRESIDENT,

IN THE CHAIR.

ON QUALITY OF TONE IN WIND INSTRUMENTS.

By D. J. BLAIKLEY, Esq.

IT may be in the remembrance of some now present, that about two years ago I had the honour of bringing before the Musical Association a short paper on brass wind instruments, in which I endeavoured to demonstrate the effects produced by variations in the forms of tubes upon the positions of the nodes of sound-waves generated in such tubes, and consequently upon the sequence of proper tones and correctness of intonation. The summary of the matter then brought forward was this: that a brass instrument is a tube closed at one end, of such a form as to give the series of intervals producible from an open, and not from a closed cylindrical tube, such form being neither a common cone, nor a conic frustrum combined with cylindrical tube. At the conclusion, attention was drawn to the fact that quality of tone was intimately associated with the points then under consideration, and it is to this subject of quality of tone that I have ventured to ask your attention this afternoon.

There are two popular opinions on this subject which we may examine at once, to clear the ground, as it were; and such examination will be found to establish only negative facts. One of these opinions is, that quality of tone depends greatly upon the material of which an instrument is made, and the other is, that tone, as regards its production at all, is in a large measure due to the rush of air through the instrument. Experiments have been at various times made, tending to show that material has little or nothing to do with the matter, and one such I can now repeat. (*Paper bugle compared with one of copper.*)

With regard to the second opinion referred to, a little consideration will show that the forward motion of air is, even in some of the most characteristic instruments, exceedingly slow. Take, for instance, the powerful tone delivered from the bell of a contra-bass saxhorn or bombardon; the forward motion of air in a bell four inches diameter would be only from about

one to three inches per second. Any influence which the mere passage of the air may have, may be reduced to zero by making suitable arrangements to sound the instrument without passing any air through it. Across the cup of this mouth-piece, just within the rim, a diaphragm of goldbeater's skin is stretched, so as to exclude from the instrument all air issuing from the lips. The breath finds an escape by means of a small tube communicating with the mouth-piece between the lips and the diaphragm.

(*Experiment.—Bugle, with diaphragm mouth-piece.*) All the proper tones of the bugle can be thus sounded without their pitch being altered, and although the intensity is small, owing to the loss of force through the escapement tube, yet the quality is fairly preserved. Leaving out of question then for the present, as not greatly influencing the matter, the possible effects of material and the passage of the air, we are reduced to the consideration of the subject under two broad divisions:—

1st. The form of vibration given by the lips, reed, or other body originating the wave motion; and

2nd. The form of the resonator: its power of reinforcing, in equal or varying degree, the different simple vibrations into which the compound tone produced by the vibrator may be analysed.

1st Division.—Form of vibration. A simple pendular vibration producing a pure or simple tone is an exceedingly difficult thing to get; a common tuning-fork does not give it, and it may be doubted whether it is obtained from any musical instrument.

(*Experiment.—Second partial given by fork of* 256 *vibrations.*) The vibrations produced by all the ordinary sources of musical sound are compound pendular vibrations; the mathematical theory held with regard to them being known as Fourier's theorem, which is thus expressed by Helmholtz: "Any given regular periodic form of vibration can always be produced by the addition of simple vibrations, having vibrational numbers which are once, twice, thrice, four times, &c., as great as the vibrational number of the given motion." Practically as well as theoretically the variety of vibrational form is infinite: probably the lips of no two players vibrate in exactly the same way, and to judge from the difficulty reed-instrument players experience in finding reeds to their taste, the same is doubtless true of these vibrators.

2nd Division.—Form of resonator. To understand clearly the varying effects of resonance, it is necessary to bear in mind the difference, in their powers of entering into sympathetic vibration, between a light and highly elastic body such as air, and a heavy body such as a tuning-fork. A mass of air can enter into sympathetic vibration with vibrations very far removed in pitch from its proper tone or tones, and owing

to this power we have the condition of partial resonance constantly occurring: In a cylindrical tube this partial resonance, or resonance of varying intensity, may be shown by merely varying the length. (*Experiment c512 fork*). But it may also be brought about by altering the forms of resonators, so that the result, when the resonator is applied to reinforce a compound tone, is a disturbance of the proportionate intensity between the different partials of that tone.

(*Experiment.—The note c256 sounded by the lips on four resonators of different forms, viz.: a pear-shaped paraffine lamp-glass, a conic frustrum, a bugle, and a cylindrical tube.*)

The tones produced from these four resonators may be analysed by means of small resonators tuned to the partial tones, the exciting of sympathetic vibration in them being manifested by the vibration of a bead hung against the diaphragm of each. Tuning one of these diaphragm resonators to *c512*, the second partial of the note sounded, we find that the bead is not affected by the lamp-glass or the cylindrical tube, but when the bugle is sounded it is violently agitated, and it is moderately agitated by the conic frustrum. Neither the lamp-glass nor the cylindrical tube has *c512* as a proper tone even approximately, and therefore neither can give resonance to *c512* when it occurs as the second partial of *c256*, but the bugle has a perfect resonance to *c512*, and the frustrum a moderately good resonance; its two first proper tones being C' and C♯''. Modifying the form of the frustrum until its second proper tone is truly *c512*, and then repeating the experiment, we find that the agitation of the bead is greatly increased. The converse of this last experiment may also be shown on the bugle, by enlarging the instrument at one of the nodes of *c512*, thereby flattening that note. Its resonance to the second partial of *c256* is now greatly diminished. By these two last experiments we find that a slight alteration in the pitch of one note greatly affects the quality of the note an octave lower: we get an example of the effect of partial resonance, and an evidence of the relationship between intonation and quality.

Without altering the form of an instrument, it is possible to modify the quality of any particular note for experimental purposes, if the positions of the nodes of that note are known. In this bugle metal diaphragms can be inserted at the nodes of its fourth proper tone *c512*, and because the nodes are positions where the air is at rest, the power of the instrument to give this particular note is not destroyed by these diaphragms, but every other note is prevented from sounding. (*Experiment.—Note sounded on bugle divided by transverse metal diaphragms into three ventral segments and one half-segment.*)

Such rough expedients, as have been just now considered,

are however, although useful for experiment, not practically available when more than one note is required from a tube or instrument; the only alterations of form admissible are such as vary the resonance without interfering, at least to any appreciable extent, with accuracy of intonation. Three brass instruments, the tenor trombone, the euphonion, and the French horn, may be taken for examination and comparison, and I will endeavour to show the existence of some of the higher partial tones, in the same note sounded from each, by the influence of these partials on a set of resonators.

(*Experiment.—Partials shown by each when B♭ is sounded.*)

One wind instrument may be made to approach another in quality of tone by varying the manner of blowing, and therefore it is not easy to fix exact data as to the number and strength of partials; yet the average results are sufficiently plain.

SCALE OF PARTIALS.

Instrument.	Note.	No. of vibrations	Partial tones heard.
B♭ Trombone ..	B♭	60	1, 2, 3, 4, 5, 6, &c. to 16. *f*
	B♭	120	1, 2, 3, 4, 5, 6, &c. to 12 *f*
	f	180	1, 2, 3, 4, 5, 6, 7. *f* [than 12 weak.
B♭ Euphonion ..	B♭	60	1, 2, 3, 4, 5, 6, &c. to 12; higher *f*
	B♭	120	1, 2, 3, 4, 5, 6, 7 *f mf f*
	f	180	1, 2, 3, 4, 5. *f*
	c	135	1, 2, 3, 4, 5, 6, 7, 8 *mf f ff*
F French Horn..	*f*	180	1, 2, 3, 4, 5, 6. *mf f*
	f	360	1, 2, 3, 4, 5, 6. *f f*
B♭ Cornet	*b♭*	240	1, 2, 3, 4, 5, 6, 7, 8 *f f f f*
Bugle	..	256	1, 2, 3, 4, 5, 6, 7. *f mf f ff*

As regards brass instruments of different characters, the chief points influencing the tone are the general form of the instrument (understanding by this the proportions of the column of air, and not the shape into which the instrument may be bent up for the convenience of the player), the extent of the flanging of the bell, and the form of the mouth-piece. As an illustration of the first of these conditions, the trombone may be compared with the euphonion; the tubing of the trombone is cylindrical for about two-thirds of its length from the mouth-piece, but the euphonion opens with gradually in-

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creasing curvature from the mouth-piece to the rim of the bell. Cylindrical tubing has the power of maintaining the compound form of vibration originated by the lips, and apparently not only of maintaining, but of intensifying and augmenting the complex character of the sound-wave. The partial tones in the pedal note of the trombone are so powerful that they determine the pitch of the note. The true prime or lowest proper tone of the instrument is considerably lower than the pedal note as sounded; * and therefore the resonance of the instrument to the lowest partial or prime of the note actually produced is imperfect. (*Experiment repeated.—Varying resonance.*)

In instruments such as the euphonion, in which the diameter rapidly increases, there is not the same maintenance of the strength of the high partial tones as the sound-waves pass from the mouth-piece to the bell. The extent of the flanging of the bell is also an important factor in determining the quality; the bell flange may be increased in size to a considerable degree without altering the pitch of an instrument; but such increase has a marked effect on the quality of tone, greatly subduing the force of the upper partials. This may be illustrated by changing the bell end of a bugle for a bell with much wider flange, more like that of a French horn; comparing the two, it will be noticed that the change in quality of tone is very marked. (*Experiment.*)

The form of the cup of the mouth-piece varies for different instruments, from that of a long deep conical funnel to that of a comparatively shallow well-rounded cup; the first form representing the French horn mouth-piece, and the second the mouth-piece for instruments of brilliant tone, as the trumpet and trombone; those for cornets, saxhorns, and bugles are of an intermediate character. It is manifest that a shallow-cupped mouth-piece favours the production of high upper partials, and it appears to me that the form of the mouth-piece modifies the initial pressure of the air at the commencement of the sound-waves. By the insertion of small water-pressure gauges in the cups of different mouth-pieces I have found that the initial pressure, or mean pressure of air caused by blowing, is distinctly measurable, and varies in different instruments. That the influence of such an initial pressure is to develop upper partials, appears to me to be shown by placing a

* The total length of the B♭ trombone (army pitch) is about 106 inches, of which the mouth-piece and cylindrical tube are 65, and the bell 41. The wave length of the pedal B♭ is 220 inches, and the cylindrical tube alone in the trombone is therefore 10 inches longer than the quarter wave length (65—10 = $\frac{210}{4}$). Taking into consideration the widening of the bell, the lowest proper tone or true pedal is probably about F, and the series of proper tones have therefore, the relationship

	of	$\frac{3}{4}$,	2,	3,	4,	5,	6,	7,	8, &c.,
instead	of	1,	2,	3,	4,	5,	6,	7,	8, &c.

vibrating tuning-fork on a sound-board. Touching the board very lightly with the fork the prime tone is well heard, but on pressing the fork down to the board the tone appears to jump up an octave; at least, the second partial is heard with great distinctness. (*Experiment.—Fork 256 on sound-board.*)

To enter at all fully into the different conditions on which quality of tone in wood instruments depends would unduly lengthen out this paper, but a few remarks may perhaps be of interest. In flutes the strength of the partials diminishes rapidly as their vibrational numbers increase. In the D (low) of the concert flute, however, the seventh partial is discernible; in the A, a fifth higher, I found that the fifth partial was the highest audible. Clarinets, it has been generally held, I believe, have only the odd-numbered partials; but this opinion, although I held it myself until within the last year, I will now venture to dispute. It is true that only the uneven-numbered notes of the harmonic series can be sounded as primes on these instruments; but this is not in itself a proof that there is absolutely no resonance to the even-numbered notes when they occur as partials. The instrument is not strictly a cylindrical tube; the slight enlargement of the bell, and the modifications of form caused by the side-holes, must be taken into account.

PARTIALS—B♭ CLARINETS.

Pitch	1	2	3	4	5	6	7	8 &c
f'	*f*	Just discernible	*f*	*p*	*mf*	*p*	...	
$b\flat$	*f*		*f*	*p*	*mf*	...	*mf*	*pp*
a	*f*		*f*	*p*	*mf*	...	*mf*	*pp*
g	*f*		*f*	...	*mf*	*mf*	*p*	*pp*
f	*f*		*f*	...	*mf*	*p*	*mf*	*pp*
$e\flat$	*f*		*mf*	...	*p*	*p*	*mf*	*pp*
d	*f*		*mf*	*p*	*m*	*p*	*p*	*pp*

(*Experiment.—Partials—3rd and 4th—shown to exist in d of B♭ clarinet.*)

Returning for a minute to the question of influence of material, it is possible, although difficult of proof, that in the clarinet the wood takes up and reinforces the vibrations of the reed which is bound down to it, in the same way that a resonance box takes up the vibrations of a tuning-fork; and that different woods act differently in this respect. In brass instruments it will sometimes occur that a portion of the instrument will enter into sympathetic vibration with a certain note, or with high partials common to various notes. This is certainly a result of the elasticity of the metal, but is an accidental blemish, to be avoided, rather than anything gained.

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There is a consideration arising out of the class of experiments with which we have been occupied, that I would venture to put before you for criticism or confirmation, as the case may be. We have found confirmation of the fact that the variety in the number of partials, and hence in quality of tone, is greatest in notes of low pitch. Further, different instruments, so far as my own experience serves me, lose some of their individuality of character when exceedingly high notes are sounded on them: for instance, very high notes on the violin, the clarinet, and the flute, do not differ from each other in quality near so much as do low notes on the same instruments. Is this to be attributed altogether to the non-production of a great variety of partial tones in notes of high pitch, or, in part, to the fact of our range of hearing being limited? It appears to me to follow as a necessary corollary from this fact of limit of range upward, that all tones which lie just within that limit must produce the same effect upon the ear, whatever their wave-form; and that even different tones, which lie well within it, may be somewhat modified in their diversity in consequence. Furthermore, as this extreme limit is not the same in all ears, it would follow that different hearers would derive different impressions from the same note. Suppose a high tone composed of first, second, and third partials to be sounding, one hearer, whose range of hearing just passed the third partial, would hear the compound tone; another, whose limit of hearing was an octave lower, would hear only the prime, and thus receive a totally different impression, and would give a different opinion as to the quality of the note. This supposititious case may perhaps serve to explain my meaning.

In these experiments I have endeavoured to bring forward evidence in support of Helmholtz's theory of compound tones, the practical outcome of which for musicians, as is well known, is that every note sounded on instruments in general use is in reality a chord comprising many tones. In attempting to get a stage beyond vague generalities of opinion as to this or that condition producing this or that result, I have found nothing which in any way militates against that theory, but only more and more convincing proof of the truth and force of it. I am fully conscious that any analysis of tone such as has been shown this afternoon is at the best but rough, and can only be considered as an approximation, and that the trained ear of the musician will detect differences which other instruments than the ear cannot do. Notwithstanding this, however, as we receive that every tint and tone which the eye can detect is either simple or is compounded of a small number of primes, so also, I think, we may accept the daily accumulating evidence which points to the ear receiving its impressions in a similar way.

I fear I may have wearied you with a mass of technical detail, but it appeared to me that for the investigation of this subject such details were necessary; otherwise we would have been driven back upon vague conjecture.

DISCUSSION.

The CHAIRMAN having invited remarks on the paper,

Mr. ALEX. J. ELLIS said that one satisfactory result of the excellent paper just read, and of the experiments given by Mr. Blaikley, was to demonstrate that quality of tone depended upon the presence or absence and varying strength of the different partials. That fact had been put before them in an unmistakable manner by the visible vibration of the beads against the resonators, as shown on the screen. One of the members of the Association, who was not present, maintained the theory that the resonators themselves generated these tones, and that they were not generated independently of them. Irrespective of the very satisfactory results of the lecture itself, it was especially interesting to him (Mr. Ellis) with regard to experiments he had been making last month at South Kensington, by which he had been able to demonstrate the existence of partial tones without the aid of resonators. He had done so with the help of Appunn's tonometers, one of which contained reeds making from 128 to 8 vibrations in a second. Of course the 8 vibrations were not heard at all, but the beating of the upper partials in this reed could be distinguished, so that he had been able, by judging from those upper partials, to determine approximately the pitch of even the 8 vibrations in a second. Down to as low even as 16 vibrations in a second, he had been able to get the twentieth and thirtieth partial tones so strongly that there was no difficulty whatever in counting the number of beats they made with forks. In fact, he had ascertained the pitch of every one of those low reeds in that way; and that also served to show an objective existence independently of any resonator, because it was only when the pitch of the fork was anything near to those partial tones that beats could ensue. He was not aware whether Mr. Blaikley had tried it, but it would be an interesting experiment to try the effect in other instruments, though possibly the beats could not be exactly counted, because the blast could not be maintained on any other instruments with the same strength or for the same length of time as upon Appunn's. But a pretty constant blast, even in the low tones, could be obtained in the other instruments; and it was in fact easy to do so if the attempt were not made below 64 vibrations in a

second. When the tones were so low as 64 vibrations in a second, the beating of the adjacent partials (such as 8 and 9, 10 and 11, 11 and 12, &c.) could be heard all the way up. That had the effect of producing a rattling sound, and taking, for instance, the strongest of Appunn's reeds at South Kensington, it was dreadfully unpleasant to hear them sounded at all. If these partials were present in anything like the same strength in higher notes, they would be unendurable. It was only when the partials were comparatively high that they gave that peculiar brilliancy of tone which distinguished some instruments, and it was of course very advisable, if mellowness of tone were desired, to find some means of lowering the effect of those upper partials—such, for instance, as the bell of the French horn, the effect of which had been shown by Mr. Blaikley, by the substitution of the larger French horn-shaped bell in place of the ordinary bugle bell. He did not know how far that idea might be carried out in practice, but it might be found possible to enfeeble the lower of those upper partials, and to produce in consequence a quality of tone more like that of the French horn though not at all the same. By that means a new instrument might in fact be produced, and one which people would probably like very much when they heard it, although unlike anything to which they were accustomed. The trombone was well known for the power of its upper partials, but those upper partials, when belonging to a very high note, would be necessarily so acute that ears could not hear them. Taking a pitch of 1024, which was not a very high note, and taking merely the twelfth or double octave of that which was only 3 or 4 times 1024, a very high note indeed was produced, and one difficult to appreciate, though in fact notes might be produced a great deal higher, as any one could hear for themselves at South Kensington by examining Appunn's tuning-forks, which went up to 40,000 in the second. He had heard and produced them, in fact, himself. So that it was not exactly true that the ear was not sensitive to those extraordinarily high tones, but it appeared to be more likely that the high partials were generated with such extreme weakness that they did not produce a sensible effect on the drumskin of the ear. The consequence, as Mr. Blaikley had pointed out, was that in the higher notes the distinctive quality of the tone of an instrument was very much missed, while, on the contrary, it came out exceedingly well in the lower notes. It had, perhaps, not been much observed that, in ordinary speaking, that which differentiates the sound of one vowel from another was more especially the quantity of the high partials in the tones of the voice. There was thereby caused a great deal of buzz in ordinary speaking by the want of differentiation in the tones, so that, when the hearer was at a distance from the speaker, the buzz was heard

but not the partial tones, and hence the utterance was not clear. That was still more the case in sounding the consonants. At any considerable distance the consonants were not heard at all, and, therefore, what the speaker was saying could not be distinguished. That showed, in fact, that a great many persons did not pronounce consonants at all plainly. These matters were also very important in their bearing upon the relation between the different speech sounds, a subject which he had been lately studying. He hoped Mr. Blaikley would go on with his experiments, which he considered were extremely valuable. He was much struck with the experiment of blocking up the tube of the bugle in four different places, so that no wind from the mouth could get into the tube at all, showing that the effect was produced merely by the agitation of the air conducted through those obstacles, the vibration being conducted from one side to the other, and the air itself not being in communication throughout the tube. That was a very valuable experiment, and it would serve to explain many of the results given by organ pipes, which in themselves would be exceedingly difficult to explain. He hoped that as Mr. Blaikley was in fact dealing with organ pipes in these resonating tubes, he would direct his attention to the extraordinary variety of quality of tone obtainable from the non-cylindrical and other curious artificial forms of tubes, such as had been used in the experiments. The paraffine chimney-glass especially reminded him of one form of those organ pipes very much. By its means a very peculiar effect had been produced. It would be very desirable indeed if some means could be found of measuring the relative intensity of the tones with more distinctness than could be obtained from the mere vibration of membranes as shown upon the screen. That effect must in fact be considered more as an interesting lecture experiment than as one conducing to the real amount of present scientific knowledge of the relative intensity of the partials. It was well known to be exceedingly difficult to measure in any respect the relative intensity of two sounds. He did not think there was any satisfactory way of doing it at all. Another point, with which he had been much struck, was the way in which Mr. Blaikley had established the existence in the clarinet, for instance, of the even partials. They certainly existed there, but whether they were produced by the motion of the air in the instrument, or from the communication of the motion of the reed to the sides of the tube, was a point to be further investigated; and he hoped Mr. Blaikley would investigate it, because it was a very important point in reference to Helmholtz's theories. In conclusion, he expressed himself much gratified with what he had seen and heard in the interesting paper and experiments of Mr. Blaikley.

Professor Grylls Adams was especially interested in one

matter which had already been mentioned by Mr. Ellis, namely, the division of the tube of the bugle into a number of separate closed pipes—for that was really the result of it—each of which would sound the note given at the end of the tube, showing that the vibrations were communicated from one closed pipe to the other. He would ask Mr. Blaikley to inform them what was the thickness of the film, or plate, which he placed between the different portions of the tube, and whether he thought the vibrations were communicated through the discs placed in the way of the blast, or whether they were communicated by means of the pipe itself. The division of the pipe into two cut out the odd harmonics of the original note, leaving only the even ones. Then, dividing it again, any special set of harmonics could be readily cut out by adding to the number of discs inserted. He was much interested in what had been said about the clarinet. Sir Charles Wheatstone had established a long time ago, or thought he had established, the fact that in the clarinet only the odd harmonics were produced, and that, in fact, it corresponded to a pipe closed at one end. The clarinet itself only differed from the closed pipe by having the key-holes arranged along it. In Mr. Blaikley's experiments there were other harmonics perceptible. The resonators were certainly beating, but it might be a question whether the disturbance in some of them was not due to the combination of other resonators near to it disturbing the air, and so consequently producing a disturbance among the resonators themselves. From a cylindrical tube with the same mouth-piece it ought to be possible to produce all the harmonics which were due to the instrument itself, but that would not be the case if the harmonics did not belong to the instrument regarded as an open pipe. It was a very interesting point for consideration whether the harmonics really belonged to the pipe or not.

Mr. Ellis pointed out that there was also a difference made by the action of the bell-end itself, as had been shown by the experiments.

Mr. Blaikley, in reply to the remarks which had been made, alluded to Mr. Ellis's observation with regard to the possibility of producing instruments with tones approximating to those of the French horn, and not as brilliant as those of trombones such as were used in military bands where it was desired to produce brilliancy of tone. Bombardons with large bells were gradually coming into use in orchestras, and the instruments were found to give an almost organ-like purity of tone. With regard to the even-numbered partials existing in the tone of the clarinet, which, being the newest point, was possibly the most interesting, it must be remembered that the clarinet is not simply a cylindrical tube, but it has a decided opening out at the bell. Thus, there is

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a slight, but not good, resonance to the even partials of some notes, and the impossibility of sounding any one of such partials as a prime may arise from the extreme flexibility of the reed through which it would be constrained to take up the vibrations of the note nearest in pitch to which the instrument gave a perfect resonance. That was probably the real explanation of the difficulty. (*Experiments repeated to prove that the beads on the diaphragm resonators were set in motion by the partial tones actually sounding, and not through the resonators generating the tones themselves.*) You can most distinctly hear the fourth, fifth, and sixth partial tones. Then with regard to the bugle being affected by the insertion of the diaphragms, it would be observed that the nodes were not coincident for every second tone; they varied in every proper tone, and there was no coincidence between the nodes of any of the tones. In conclusion, he thanked the meeting for the attention and interest they had shown in the paper.

The CHAIRMAN asked how the passage of the sound through the tube closed by the diaphragms could be accounted for?

Mr. BLAIKLEY said it was by the agitation of the air simply communicated from one side of the diaphragm to the other. The diaphragms were perhaps only about one-fiftieth of an inch thick, but they were quite solid.

A vote of thanks was unanimously awarded to Mr. Blaikley for his paper.

April 5, 1880.

Rev. THOMAS HELMORE,

In the Chair.

REMINISCENCES OF FREDRICK CHOPIN.

By G. A. Osborne, Esq.

The paper on "Berlioz," which I had the honour of reading at one of our meetings last session, having been so kindly received by the members of the Musical Association, I have been induced to give one on "Chopin," with whom, as with Berlioz, I was intimately acquainted during my stay in Paris, where I resided for many years. Everything connected with Chopin has, at the present day, much more than ordinary interest. His works being so frequently presented to the public by performers of different nationalities, capable not only of mastering with ease the mechanical difficulties with which they abound, but also his interpreters being imbued with the poetic spirit which pervades his compositions, they are in most cases well rendered; for no one who does not thoroughly appreciate them can hope to interest an audience. In this short sketch I intend presenting Chopin to you under a three-fold aspect—his appearance, character, and mode of life, prefacing my remarks with a short account of his early years. In a village near Warsaw Chopin was born, according to Karasowski, on the first of March, 1809, and not 1810, as inscribed on his monument at Père la Chaise. He had undeniably a delicate constitution, and was often implored by a loving mother and sisters to wrap up carefully, a request not invariably acceded to, as we all know by experience; still it is asserted by Wilhelm von Kolberg, who knew him well, that till manhood he was only ill once, and then from a cold. Gross exaggerations have certainly been current respecting his health, and Goethe says most truly, "People believe the truth so little because it is so simple." In his earliest years Chopin was so sensitive to music, and showed such a decided love for the piano, that his parents confided him to the care of Zwina, an impassioned pupil of Sebastian Bach. His progress was rapid, so much so that before he attained his ninth year he played a concerto in public, attired in a handsome jacket and collar. Being asked by his mother, after a loving embrace, "What the public liked best?" he naively replied, "Oh,

mamma, everybody looked only at my collar." His success, however, at this concert was so great, that he at once became a great favourite, and was received by the flower of the aristocracy. It is generally supposed that the first idea of future greatness was suggested by the present of a watch given him in 1820 by Madame Catalani, which bore the following inscription: "Madame Catalani to Fredrick Chopin, aged 10 years." To overcome the technical difficulties of the piano he laboured incessantly and perseveringly. He delighted in extended arpeggio chords, and to render them easy, he manufactured a mechanical contrivance which he kept between his fingers during the night. Those who have played his Eleventh Study in E flat can fully understand the advantage of having supple fingers with increased space between them.

Chopin had extraordinary vivacity of temperament. The tricks he played on his schoolfellows were innumerable, and he was considered by Albert Piasecki, the eminent dramatic artist, to be a born actor, on account of his presence of mind, excellent declamation, and capacity for rapid facial changes. In his bedroom he had a piano, and frequently during the night he would get up and play some passing thought, to the astonishment of the servants, who, not understanding him, would say, with a shake of the head, "Ah! the poor young gentleman's mind is affected."

With Elsner, who first discovered Chopin's creative originality, he learned counterpoint, and with him he was united till death in the bonds of loving friendship. To those who remarked to Elsner that his pupil did not adhere to the customary rules of music, but followed his own fancy, he would say, "Leave him alone, he does not follow the common way because his talents are uncommon; he does not adhere to the old method because he has one of his own, and his works will reveal an originality hitherto unknown." Many a master would have quenched his youthful aspirations. The Mazovians have an intense love for music, and a distinguished Polish writer, Julien Klaesko, says, "The love of song characterises the Sclavonic above all other races; the rudest peasant could be allured to the end of the world by his national songs." Chopin had a predilection for them, and we trace in his music much of their influence. He often wondered who was the creator of those expressive melodies, originated in the cottage by composers whose names will always remain unknown. In college his easy charming character made him beloved by his fellow-students, many of whom belonged to the first Polish nobility, who frequently had him as their guest, and with whom he acquired the manners of a courtier, which he retained through life. When he was fifteen he had all the grace of youth combined with the gravity of a more matured age.

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His physiognomy was charming, and the absence of muscular development in his frail body rendered him at all times an object of the tenderest interest. With his natural grace he had the gift of pleasing even those with whom he was but slightly acquainted. The culture of his mind and the originality of his conversation secured for him the attention of the most eminent men. Chopin was not above middle height. His complexion was delicately transparent; his smile good-natured; his eyes dark brown, more cheerful than pensive; his nose Roman, but slightly aquiline; his voice musical, but subdued.

As soon as his college course was terminated, it was deemed advisable that he should travel and become acquainted with celebrated artists, and hear the best performance of the great classical works. In his letters to his parents and friends we have abundant proof of the pleasure he enjoyed when hearing such works, and his admiration of many artists whose friendship he enjoyed. In one of his amusing letters he mentions being received by the master of the house, with many compliments, into a room where a number of ladies were sitting at eight large tables. No flashing of diamonds met his gaze, but the more modest glitter of a host of steel knitting needles, which moved ceaselessly in the hands of these industrious ladies. The number of ladies and of needles was so large, that if the ladies had purposed an attack upon the gentlemen the latter would have been in a sorry plight; the only resource left them would have been to have made weapons of their spectacles, of which there were as many as there were bald heads. Chopin was at times very gay, and—as he says of himself—seized with a spirit of mischief. Once, in a sedan chair, which he called a queer, comfortable box, he had a great desire to stamp through the bottom of it.

Perhaps none of my hearers know anything of the pleasure of a sedan chair, so I shall relate my personal experience of such mode of conveyance. Before I left Ireland, when quite a lad, having to play with an amateur violinist at a party, I went there in a sedan chair, the night being stormy and wet. I had not gone far when, standing up to arrange my coat, the bottom of the chair—which I suppose was not very firm at the time—gave way, and I had to run with my two bearers, who were trotting at a good pace. In vain I tried to make them hear, but to no purpose; and, after a run through several streets, I arrived at my destination covered with mud, and with a very unprepossessing appearance. I wanted to return home at once, but my violinist friend—who was the master of the house—objected, and said he would make all right. Taking me to his room, he dressed me in a morning suit six times too big for me, and I was then conducted to the drawing-room, where I was introduced to the

assembled guests in a speech that had a great deal to do with the inclemency of the weather, and a bold assertion on his part that he never saw me look better in his life.

When the revolution broke out in Poland, Chopin was arranging a concert in Vienna, which did not take place. The fact of his being a Pole raised insuperable difficulties, so many being afraid of compromising themselves. He had a great desire to return to his country, and follow the army with a friend. "Take me," he said, "as your drummer." Fortunately he was dissuaded from his warlike purpose, and his friend, who hoped to return a colonel, was killed in action. In a letter to his most intimate friend, Hauscher, he thus writes: "I would not willingly be a burden to my father; were I not afraid of that I should immediately return to Warsaw. I am often in such a mood that I curse the moment I left my beloved home. I am melancholy; there is not a soul I can unreservedly confide in. I have lost my peace of mind, and only feel happy when I can read your letters or look at my precious ring." This ring was given to him by a young Polish lady of whom he was enamoured, and it is of her he speaks when, in the same letter, he asks, "Does she really look so changed? Do you think she was ill? She is of such a sensitive nature that this is not at all unlikely. God forbid she should suffer anything on my account; comfort her, and assure her that as long as my heart beats I shall not cease to adore her. Tell her that after my death my ashes shall be spread beneath her feet."

It is said of Chopin that he disliked the numbers seven and thirteen, and would not undertake anything of importance on a Monday or Friday, such days being considered unlucky in Poland. After some difficulty about his passport he came to Paris, and was delighted with the gay capital. Things had not then quieted down, after the revolution which placed Louis-Philippe on the throne, and parties were politically divided. From all he heard of Kalkbrenner he was anxious to become his pupil, and particularly so after hearing him play. In a letter dated December 6, 1830, he says: "Kalkbrenner's touch is fascinating. The quietness and equality of his playing are indescribable; every note proclaims the master. He is truly a giant who dwarfs all other artists." During several weeks I heard Chopin play frequently, and was questioned by him as to Kalkbrenner's system of teaching, as I had been then his pupil for two years. He wished to place himself under his care, and was much surprised to find me dissuading him from it, saying: "This is strange, indeed, from you." "Not so," I replied; "I thoroughly value my master, but I am an ordinary mortal; you are not, therefore remain as you are; for should you become his pupil, very little of you will be left. If I mistake not you will become a great artist, and many

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of your peculiarities as a player will be imitated even by Kalkbrenner's pupils, when they have finished their time with him." To his father and others, whose advice he valued, he communicated his wish, the fortunate result of which was that he remained his own master.

In Paris he received an ovation from the cream of Parisian society. A new phase in the poetic sentiment was revealed along with innovation of form, which captivated all who heard him; and the modesty with which he acknowledged applause, enthusiastically bestowed, gained for him an esteem which increased as he became known. Having mastered the technicalities of music, Chopin could improvise to an unlimited extent on any given theme, producing the most marvellous effects; and those who heard him at such times say that his finest compositions are but a reflex and echo of his improvisations. The great steadiness of his accompaniment, whether with the right or left hand, was truly remarkable, and his playing, thus freed from all trammel, acquired a peculiar charm. Chopin's finest works are to be found in the smallest forms, such as his nocturnes, mazurkas, ballads, and studies, which are redolent with poetry.

Residing close by Chopin's residence, I was a frequent visitor, and had the advantage of hearing him play his compositions when still in manuscript. Even when published he would introduce *fioritures*, always varying them when repeated with new embroideries, according to the fancy of the moment. In bravura passages he would sing out as loud as he could, occasionally exclaiming, "This will require force and dash," evidently having Liszt in his mind. Although there is a strongly marked rhythm in Chopin's *polonaises*, *mazurkas*, and *cracoviennes*, they are unlike all compositions with similar titles that have preceded or followed them, and, indeed, it would be difficult to imitate them without plagiarism. All his compositions seem to be suggested by thoughts of his country, which present many phases of different character, so remarkable in nations struggling for freedom. Chopin will always be considered a poet essentially Polish, for in all his compositions he gives expression to the national feeling. Speaking of Herr Haslinger, the music publisher, he says: "He is a shrewd man trying in a cautious way to induce me to let him have my compositions gratis. Perhaps he thinks that by treating my works as 'bagatelles' I shall be only to glad to get them published, but the time for gratuitous work is over with me; now it is 'pay.'"

The concert which he gave on the 26th of February, 1832, was financially a failure. It was only attended by well-to-do Poles; scarcely any of the paying French public were present. He played his F minor Concerto, other pieces also, and a Polonaise for two pianos with Kalkbrenner, the accompani-

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menta being played on other pianos by Hiller, Osborne, Stamaty, and Sowinsky. Many friends tried to console him for the financial failure, telling him to wait patiently for better days: but he wished to return to Warsaw; he yearned for his home and felt deeply for his country. On the very day that he was preparing for his departure he met Prince Valentine Radziwill, who persuaded him to go that evening to a party at Rothschild's. This was the turning point in his career. He went, and played so marvellously, and received so many compliments and applications for lessons, that all seemed now changed as if by magic. There was no longer any need of assistance from his parents, so he at once relinquished the idea of returning to Warsaw. Chopin was always in good spirits when with Hiller. Those who had the privilege of attending Hiller's *soirées* had the advantage not only of hearing some of his own exquisite compositions, but also those charming gems of his Polish friend, played by the composer. Being now freed from much anxiety, Chopin's wonted gaiety returned, and he was the life and soul of parties, especially those where he met his artist friends. One evening, at one of Hiller's receptions, which were much sought after, he was asked to play, when he proposed Hummel's Sonata in A flat for two performers. By previous arrangement I was to play the bass. We had gone through but a few bars when there was a rush to the piano and general laughter. The cause of this was the personation of Moscheles and Pixis, the countenance and manner of whom we were considered to have imitated to the satisfaction of all present, as evinced by the applause we received. During Mendelssohn's visit to Paris he frequently dined at a restaurant with Hiller, Chopin, and myself, each ordering the dinner in turn. One evening at dessert the conversation turned on authors and their manuscripts, which was very animated. When ready to leave, it being my turn to pay the bill, I called the waiter, and instead of asking for *la note à payer*, I said, "*Garçon, apportez moi votre manuscrit*," which seemed to tickle the fancy of those present, but especially of Chopin, who was much amused at the profanation. He was fond of relating observations overheard by him on himself, especially if they were unfavourable. One of the remarks was, "That young man has a light touch, but he can't compose." Chopin never imitated other composers. Schumann speaks highly of his Concertos in E and F minor, making merry over his opponents, whom he humorously likened to the French in the time of Louis-Philippe refusing to recognise the legitimate Duke of Modena as king, because he ascended the throne by a revolution.

Schumann did much to popularise Chopin in Germany, pronouncing him at once an unmistakable genius. In a letter to Heinrich Dorn, he says: "The day before yesterday, just

as I had received your letter and was about to answer it, who should walk in but Chopin. This was a great pleasure to me, and we spent a delightful day together. The way he sits down to the piano is exceedingly impressive. You would be very pleased with his playing. Imagine to yourself perfection unconscious of its own merit."

Here is the opinion of Moscheles, in 1833: "I am a sincere admirer of Chopin's originality. He produces the newest and most attractive pianoforte works: but, personally, I object to his artificial and often forced modulations; my fingers stick and stumble at such passages, and, practise them as I may, I never play them fluently." Six years later, in a letter from Paris, he thus writes: "Chopin's appearance corresponds exactly with his music—both are delicate and fanciful. The *ad libitum*, which with his interpreters degenerates into bad time, is, in his own hands, the most charming originality of execution; the harsh and dilettante-like modulations, which I could never get over when playing his compositions, ceased to offend when his delicate fairy fingers glided over them. He is quite unique in the pianistic world." In a letter to his sister, Mendelssohn thus speaks of Chopin: "There is something so thoroughly original and masterly about his pianoforte-playing, that he may be called a truly perfect virtuoso; and, as I love perfection in any form, I spent a most agreeable day with him. I was very glad to be once more with a thorough musician, not with those half virtuosi and half classicists who would like to unite *les honneurs de la vertu et les plaisirs du vice*, but with one who has a clearly defined aim; and although this may be the poles asunder from mine, I can get on with such a person capitally, but not with those half-and-half people."

In 1834 Chopin gave his second public concert in Paris, at the Italian Opera-house, which was in a pecuniary point of view a great success. He played his E minor Concerto with orchestral accompaniments for the first time. His refined playing was not heard to advantage in so large a theatre. He was disappointed at having failed to excite the enthusiasm he wished for, and for a long time would not venture to perform in a large public hall.

When asked if he studied much before giving a concert, he would answer, "It is a dreadful time for me; I do not like public life, but it is part of my profession. I shut myself up for a fortnight and play Bach—that is my preparation. I do not practice my own compositions." When speaking to intimate friends, he would sometimes say, "I believe that my works will stand on their intrinsic merits; whether these be recognised now or in the future is immaterial." Mozart was Chopin's ideal type, whose sweet melodies had for him a more fascinating charm than the colossal conceptions of Beethoven's

genius. He had a strong aversion for anything commonplace. He did not agree with Mozart's father, who said to his son, after a representation of "Idomeneo," "You have been wrong in putting in it nothing for the long ears." To be heard to advantage he required a small and select company of connoisseurs, who could appreciate in his *cabinet pictures*, as Liszt calls his short pieces, all the poetical refinement which was his peculiar characteristic. "I am not adapted for giving concerts," said he to Liszt. "I feel timid in presence of the public; their breath stifles me; their curious gaze paralyses me; but with you it is a vocation, for if you do not please the public, you know how to agitate and overwhelm them."

In 1836 Chopin went to Marienbad under the pretence of trying a cure. The young lady whom he worshipped in his youth was married in Warsaw. He was deeply grieved and even enraged at the news, but time, the great healer of wounds, calmed his ardent spirit, so much so that he was soon engaged to another young lady, sister to one of his Polish friends whom he met in Paris. All idea of future travel was given up; he looked forward to a career in Paris which promised to be all he desired. Alas! his hopes were again blighted, for not long after his departure he was informed that his affianced elected to be a countess instead of the wife of an artist. Finding his hopes again shattered, and deeply pained by the result, he allowed himself to be ensnared by a most clever and talented woman, who, according to Karasowski, exercised a most baneful influence over him. This lady was Aurora Dudevant, the celebrated French authoress, who wrote under the name of George Sand.

Here I may observe that on this subject I speak only from hearsay, for I was not personally acquainted with George Sand, though I met her frequently in society. His heart was at first untouched, for in a letter to his parents he says "I have made the acquaintance of an important celebrity, Madame Dudevant, well known as George Sand; but I do not like her face, there is something in it that repels me." She was passionately enamoured of Chopin, and when with him her rather manly features assumed an attractive softness. He felt a happy pride in being loved by a woman of European celebrity, and soon forgot his affianced's faithlessness.

He now began to withdraw himself from his large circle of acquaintance, giving himself up to a few very intimate friends, among whom were Liszt, Hiller, Ary Schaffer, Eugene Delacroix (two famous painters), and the German poet, Heinrich Heine, of whom Enault said that sarcasm had consumed his heart and scepticism swallowed up his soul. In the autumn of 1837 Chopin was much weakened by a pulmonary attack, and, contrary to advice, accompanied George Sand to the island of Majorca. Here he soon became worse, and although he

bore his sufferings manfully, he could not control his restless imagination. George Sand thus writes of him: "Chopin's character showed itself in varying circumstances; although sensitive to all marks of friendship and smiles of favour, he would remember the slightest offence for days and weeks together. Real grief never troubled him so much as small vexations. He could not overcome this morbid weakness of character, and his irritation was often out of all proportion to the cause. Like very imaginative and nervous men, he would torment himself ceaselessly with melancholy thoughts. His excessive anxiety about trifles, his insuperable repugnance to the slightest sign of poverty, and his luxurious habits, must have made his residence in Majorca very distasteful to him. But he was not in a condition to travel, and when he was somewhat recovered contrary winds arose, and the ship was obliged to remain at anchor for three weeks. Our stay at the cloister was a misery to Chopin, and a hard trial to me." In writing also to a friend, she speaks of Chopin's physical sufferings as being increased by the most dismal imaginations. "Far from picturing the soul of a beloved one in a better world, Chopin had dreadful visions. The spirits harass and entangle him in their magic circle, and instead of seeing his departed friends smiling at him from the abodes of the glorified, he imagines that their lifeless forms are at his bedside, or that he is tearing himself from their cold embrace."

In 1844 he was much affected by the death of his father, and unable to write to his mother on the sad event, probably owing to his *liaison* with George Sand, who wrote a touching letter for him. He certainly considered his connection with this talented woman a sacred bond, and would have led her to the altar had it been possible. Her attachment for him soon began to waver, and he was grieved at the complaints she often made in his presence of the fatigue of nursing him. He implored her to go to the theatre, and give parties, telling her he would be content if he knew that she was happy. At this time George Sand had written a romance, entitled, "Lucrezia Floriani," in which she appears as the heroine and Chopin as Prince Charles. He was truly mortified on reading this book, and particularly so when George Sand's children said to him, "Monsieur Chopin, do you know that Prince Charles is meant for you?" During a violent scene, of which the daughter was the innocent cause, a complete rupture ensued. To the mother's unjust reproaches he merely replied, "I shall leave your house immediately, and I only desire that my existence may be blotted out from your memory." The same day the enfeebled artist quitted her for ever.

This account is certainly the one most credited by those, and they are many, with whom I have conversed on the subject. I think it but fair, however, to bring before you the

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opinion of "An Oxonian," as given by the *Musical Times* in the February number of this year. The writer comes forward as the champion of George Sand to demolish Karasowski, as Karasowski to a certain degree came forward to demolish Liszt. My mission is not a demolishing one, and you will have to draw your own conclusion from statements set before you. I cannot help thinking, however, that Chopin was in a very exceptional state of mind, having lost, as he did, two objects of his affection. I agree with the "Oxonian" that he was not attracted by the intensity of George Sand's love, but that he hungered after sympathy, which she abundantly bestowed on him. Her position was a peculiarly painful one, having a son of twenty-four years, whose temper was sorely tried by Chopin's extreme sensitiveness, and who, as is said, threatened to leave his mother's house. The rupture which took place, arising from whatever cause, was accepted by the great novelist, and considered by her, according to the "Oxonian," as rightly purchased after eight years of maternal devotion.

After this separation Chopin was laid on a sick bed by grief and agitation, so much so that his recovery was thought hopeless by his friends and Gutman, his favourite pupil, who nursed him with unremitting care. Through the indefatigable efforts of doctors and nurses he somewhat recovered, and gave a farewell public concert at Pleyel's, where he had a most enthusiastic reception from a select and distinguished audience. One evening, when walking on the boulevards, he said to a friend, "I wish that some good genius would put twenty thousand francs into my desk; that would set me up once for all, and I could indulge in the comfort of which I am so fond." That night he dreamt that his wish was realised, and a few days after, on opening a secret drawer, he found the desired sum, the gift of Miss Sterling, a Scotch lady and one of his devoted pupils, who, on hearing of his wish from Symilkowski, gave the £800, which he managed to place there. Having had many invitations to visit England, where his works already enjoyed a well-deserved popularity, he started for London. He was presented to the Queen and played at Court, but late evenings and want of sleep materially injured his weak constitution. He accepted engagements in Scotland, but the climate was too severe for him, and his Scotch friends, although with the best intentions, gave him no rest; they would introduce him to their relations, positively killing him with kindness. In a letter to one of his friends he says: "I have played at a concert in Glasgow before all the *haute volée*. To-day I feel very much depressed—oh, this fog! Although the window at which I am writing commands the most splendid view in Scotland, I can see nothing except when the sun breaks momentarily through the mist. I shall soon forget Polish, and speak French like an Englishman, and English

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like a Scotchman. I feel weaker and weaker, and cannot compose, not from want of inclination, but from physical causes, and, besides, I am in a different place every week. But what am I to do? I must at least lay by something for the winter."

On a tour which I made with Alboni, I met Chopin at Manchester, where he was announced to play at a grand concert without orchestra. He begged I should not be present. "You, my dear Osborne," said he, "who have heard me so often in Paris, remain with those impressions. My playing will be lost in such a large room, and my compositions will be ineffective. Your presence at the concert will be painful both to you and me."

Notwithstanding this appeal I was present, unknown to him, in a remote corner of the room, where I helped to cheer and applaud him. I heard him then for the last time, when his prediction was fulfilled in part, for his playing was too delicate to create enthusiasm, and I felt truly sorry for him. His performance at that concert, however, has not effaced those pleasurable and vivid emotions which I hope ever to retain of his playing and of himself. He was now longing to be back in Paris, and gave minute directions for a suitable residence, and even to buy bunches of violets to make the room smell sweet. Before leaving London he performed at a concert for the benefit of Polish emigrants, which was numerously attended. In Paris, his disease, which in 1840 manifested decided symptoms of an affection of the lungs, made rapid progress. He seemed in a manner to long for death, and expressed a wish to be buried at Père la Chaise, beside Bellini. His last hour was now approaching. He asked the Countess Potoka, who was weeping bitterly, to sing something. Mastering her emotion, she sung Stradella's Hymn to the Virgin, at the termination of which he feebly exclaimed, "Oh! how beautiful. My God, how beautiful! Again, again!" She then sung a psalm by Marcello, weeping friends kneeling at his bedside. Evening closed in, and the next morning, feeling a little better, he asked for extreme unction, and confessed to a pious priest. To those around him he gave his blessing, and, after moistening his lips with water, kissed the hand of Gutman, his devoted friend and pupil, and, with one sigh, closed his eyes for ever. Many a tear was shed when his death became known, for he was beloved by all who knew him well. His funeral obsequies took place in Paris, at the Madeleine Church, where Mozart's Requiem was sung, the solo parts being taken by Mesdames Viardot-Garcia, Castellan and Signor Lablache: Meyerbeer conducted. Chopin's Preludes in B and E minor were played on the organ by Lefébure Wely. According to a custom less common than formerly, Chopin was laid in the grave in the clothes he wore at his

concerts, and a goblet of exquisite workmanship, filled to the brim with his native earth, which he fondly cherished, and which was presented to him nineteen years previously at a banquet given at Wolna in his honour, was now emptied of its contents on his coffin.

Those of my audience who desire to know more of that greatly gifted musician will be amply repaid by the perusal of his life by Liszt, his sincere and loving friend; also by a new volume, entitled, "Fredrick Chopin: His Life, Letters and Works, by Moritz Karasowski." It is no easy matter to compress within a short space of time all that an audience would like to hear and a lecturer to impart. I have tried to deal with my subject so as to give you as much information as possible, and my anxious wish now is that you may not have found me tedious.

DISCUSSION.

The CHAIRMAN proposed a vote of thanks to Mr. Osborne, for the interesting paper he had given, which was carried unanimously.

Mr. OSBORNE, in acknowledging the compliment, said it was always encouraging to a lecturer to find his efforts appreciated by his audience, and it was especially so to him under present circumstances, as he had been suffering for some time from sciatica, and up to the last moment it was even doubtful whether he should be able to come; indeed, he thought it would be necessary to have himself transported from the street through the drawing-room window by a crane, to avoid the fatigue of walking upstairs. He should be glad to answer any questions any one might wish to put with regard to Chopin.

Mr. HIGGS said his knowledge of Chopin was chiefly derived from Grove's "Musical Dictionary," in which it was rather represented as if Kalkbrenner desired to have Chopin for a pupil, and tried to persuade him to place himself under his instructions, and this hardly agreed with the account Mr. Osborne had given. He should also be glad if Mr. Osborne could give any further particulars with regard to Chopin's favourite pupil Gutman, to whom he had referred, or any other of his pupils.

Mr. OTTO GOLDSCHMIDT said he had had the good fortune to be present at the concert in Paris to which Mr. Osborne had referred, in 1849, and still retained a perfect recollection of it. It was at the end of January, within a fortnight or three weeks of the revolution of 1848, and Chopin was then already affected by the disease which a year and a half later took him off. He was extremely weak, but still his playing—by reason

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of that remarkable quality which he possessed, of gradation in touch—betrayed none of the impress of weakness which some attributed to *piano* playing or softness of touch; and he possessed in a greater degree than any pianoforte-player he had ever heard the faculty of passing upwards from *piano* through all gradations of tone. As Mr. Osborne had remarked, his *rubato* playing was really no *rubato* playing at all; his left hand kept a very distinct rhythm and perfect time, whilst the right hand performed independently, just as a finished vocalist would sing properly accompanied by a sympathetic accompanist. On this occasion he played on an instrument by Pleyel to which he was particularly partial: he had a great fancy for the pianos of this maker, who was himself a great performer as well as an instrument maker. This concert was particularly remarkable in a social point of view, because it took place almost immediately before the revolution broke out, and at the time of those famous political banquets in Paris which immediately preceded the revolution of February. Of course great excitement followed, and he had very little doubt that one of the reasons of Chopin leaving Paris was the disturbed state into which France had fallen. He was supported at this concert by Alard and Franchomme, with whom he played a trio by Mozart, and by one of Madame Viardot-Garcia's nieces as the vocalist. It was extremely difficult to obtain admission, for Chopin, who had been truly described as a most sensitive man—which seemed to be pre-eminently a quality of artistic organisations—not only had a list submitted to him of those who ought to be admitted, but he sifted that list, and made a selection from the selected list; he was, therefore, surrounded by none but friends and admirers. The room was beautifully decorated with flowers of all kinds, and he could truly say that even now, at the distance of thirty years, he had the most vivid recollection of the concert. Chopin played, in addition to the trio of Mozart, many of his own compositions; not the tremendous ones, such as the A flat polonaise, but several of his nocturnes and studies; and the audience was so enraptured with his playing that he was called forward again and again, and played some of those later waltzes which had made such a sensation all through Europe. With regard to his teaching, he might say that he had known intimately one of his later pupils, the one who, in his humble opinion, had given the only correct and true edition of Chopin's works, a Norwegian of the name of Tellefsen. He studied under him in Paris, and knew Madame George Sand, and their relations; but with regard to that subject, it seemed to him so delicate a one that it was best passed over. He had read carefully Karasowski's "Life of Chopin," and also the admirable defence of Madame George Sand, by "An Oxonian," in a recent number of the *Musical*

Times. He doubted whether the view taken by the latter was the one which would present itself as the true one to many who were at the time in Paris, but however that might be, he thought it was well not to dwell upon that point. Chopin was an extremely conscientious master; as far as he could learn, his pupils had to study a great deal the works of Sebastian Bach and also those of Mozart, as well as his own compositions. He had a great notion that he was less fitted to teach general pianoforte music than that of these composers and his own. He himself was sent to Paris to be placed under him, but the revolution intervened and prevented it. M. Tellefsen, however, remained his attached pupil to the end, and he believed he was present during the latter weeks of his illness, and he had related to him one very interesting circumstance—namely, that Chopin caused all his unpublished compositions to be burnt before his death. There had been a great deal of controversy with reference to Mendelssohn's posthumous compositions; and Chopin was ill long enough to see that all his unpublished works and letters were burnt. That explained to a great extent why so few posthumous compositions had seen the light.

Mr. Salaman said there were probably few present who had had the good fortune to hear Chopin, and as he had enjoyed that great pleasure, he thought it only right to state his impressions. He heard him after the concert in Paris to which Mr. Goldschmidt had referred, namely, at an evening party given by the late Mrs. Sartoris; he could not state exactly the month, but it was when he was in England. He was at that time in a very delicate state of health, being little more than a shadow of his former self; but he played most charmingly. He should never forget his playing; he had a very delicate and refined touch and the most exquisite expression possible. There was one piece he remembered in particular, the well-known waltz in D flat; he remembered every bar, how he played it, and the appearance of his long, attenuated fingers during the time he was playing. He seemed quite exhausted after his performance, and he was informed that he was in so weak a condition that he had frequently to be carried up and down stairs.

Mr. A. D. Coleridge said he remembered some few years ago to have read some interesting letters from Heine in Paris, in which he gave his opinions of Meyerbeer, and the great musicians of that time, and amongst them were what appeared to him some extremely satirical, if not unkind, remarks about Chopin; he should therefore be glad if Mr. Osborne could give any information about the latter's relations with Heine, whether they were of an intimate character, or only a general acquaintance.

Mr. Osborne said there was no doubt in the world that

Kalkbrenner desired Chopin to be his pupil, but what Chopin could have gained by lessons from him he could not see. It may be asked, why did he wish to become his pupil; and to that he could only say that when he came to Paris he found several great artists playing there belonging to the school of what might be termed thunder and lightning pianoforte-playing. His reputation was not yet established as a composer, and he felt he should like to be able to come before the public and get some share of patronage as a pianoforte-player. This, however, he never did. In all his concerts he was admired as a composer, but as a player in large rooms he was nowhere. He quite agreed with Mr. Goldschmidt about his pianoforte-playing and his method with his pupils; because, whilst Chopin was always asking him about Kalkbrenner's method, he on his side was always asking Gutman what Chopin did, and he learned that his great object was to get the left hand perfectly independent, so that it might keep the time regularly, whilst the right was more free to develop the theme under treatment. With regard to the works which he recommended to his pupils, they were those of Sebastian Bach, Mozart, and also the "Gradus ad Parnassum," by Clementi. He never heard Gutman play, but he knew that he was highly considered as a performer by those who heard him. With regard to Heine, he had also had the pleasure of his acquaintance, but he was always in very delicate health, and therefore had not had so much opportunity of knowing him. He always heard, however, that he was always very glad to be with him. He certainly was not aware of any unkind expressions being used by Heine, and all he could say was that he was very sorry if it were so. In conclusion, and just to show the difficulty of arriving at correct dates in biographical matters, he might state that Chopin's birth had been given as 1809, by Karasowski, whilst his tombstone stated 1810; but at the beginning of this year a monument to his honour had been inaugurated at Warsaw where his heart was deposited, and there it was stated that he was born in 1810, this date corresponding with that on his tombstone in Père la Chaise. He, therefore believed that 1810 was the correct date, because Chopin's sister was in Paris when he died, and one would suppose that she would be able to give the right date.

Mr. Salaman proposed a vote of thanks to the Chairman, which was carried unanimously, and the meeting adjourned.

May 3, 1880.

Professor W. H. MONK,

In the Chair.

ON MUSIC AS A PROFESSION IN ENGLAND.

By Charles Kensington Salaman, Esq.,

Honorary Member of the Academy Saint Cecilia, Rome.

Were the observations I am about to address to you intended only for the hearing and perusal of the members of the Musical Association, I might long have hesitated before I ventured to discourse upon music as a profession in this country, inasmuch as I do not presume to think that I can say anything upon that subject which is not as well known to them as to myself. Still, with a professional experience of more than half a century, I am not without hope that I may, perchance, touch upon topics which may prove to be of interest and utility to my younger and less experienced professional brethren and sisters. I shall, of necessity, leave much unsaid which may be considered worthy of notice, and shall hope, therefore, that in any discussion which may follow the reading of this Paper you will generously supplement my inadvertent omissions.

The profession of music may be surveyed from two points of view, which I shall term the purely artistic, and the purely professional. By the former I mean the practice of music with reference alone to the art, its cultivation, and its progress. By the latter I mean the practice of music as a source of income. While giving full consideration to the emoluments of his profession, the true musician will never ignore his obligations to art; but will uphold its dignity, and guard with jealous care its inherent purity from every contaminating influence. It is from the latter view that I am about to survey music and musicians.

As in the military profession there is one common appellation—soldier—alike for the general and the private, so, in the musical profession, there exists but one designation—musician—for the most illustrious composer, the most accomplished virtuoso, the music-hall vocalist, and the most *in*efficient member of a German street-band. It is nevertheless understood that, in its widest acceptation, the title "musician" is truly applicable to those only who, as composers or executants,

are entitled to it by their complete acquaintance with the theory and practice of music.

To the excited fancy of many ardent lovers of music outside its boundaries, the musical profession would appear to be encircled by a kind of halo of unceasing pleasurable action, calculated to charm the imagination and fire the enthusiasm of ambitious candidates for musical distinction. Whether this be a seeming or a reality will appear hereafter. It is, perhaps, more than any other profession remarkable for the multiplicity and diversity of its several departments, which, with its numberless tributary branches, are evolved from its two large divisions—composition and performance.

The choice of music as a profession is ordinarily the consequence of a combination of considerations. An inclination—a disposition rather—towards the art evinced in youth, if not in infancy, most commonly determines the career of the embryo musician. A catalogue of infant musical prodigies would include almost every famous name in musical history.

Remarkable aptitude for music, and the rare gift of genius, are mostly manifested in the middle ranks of society, and often among the so-called labouring classes, who, in all ages and in all countries, have prolifically endowed the world with rich examples of resplendent genius in every department of art, science, and literature. A musical genius is seldom found in aristocratic circles. The continuous untiring application and severe discipline which are imperatively demanded from the earnest student of music are qualities which are not ordinarily exercised by the noble and the wealthy, to whom the stimulating incentives to industry, viz., ambition and limited means, are wanting.

The study of music, as we all admit, is wholly engrossing. Exacting the most careful training, it can hardly be entered upon at too early an age. Those who commence to study music when the ardour of the heart has commenced to cool, and the elasticity of youth has slackened, labour under disadvantages almost insurmountable. Reverse of fortune has impelled many talented amateurs, who had previously basked in the sunshine of favour and fortune, to turn to music as a means of subsistence. The insufficient emoluments of public offices have tempted others to take refuge in music, and to enter its wide arena in a professional capacity. Rarely has this somewhat hazardous experiment realised hopeful anticipations. Encouraged possibly by the alluring plaudits and flattering encomiums of admiring relatives and friends, many quondam dilettante have entered the lists with famed artists as composers, singers, and instrumentalists. In many instances they have too late discovered the remarkable difference between the display of moderate musical ability before a gathering of eulogistic auditors, and its public exhibition, in

a professional character, before assemblies of impartial, unsympathising, and possibly, uncharitable critics.

The social status of the highly cultured professor of music has risen considerably. This honourable elevation has been graciously recognised by Her Majesty, whose bestowal of social rank upon many deservedly esteemed native and foreign resident musicians, has marked upon the annals of the entire musical profession a new and conspicuous era. Thus there exists an additional incentive to the young musician, who would aspire to exalted professional rank, so to qualify himself as an accomplished artist, a man of superior intellectual attainments, and a highly bred gentleman, that he may be prepared to accept and maintain a distinguished position in any society to which, by his professional and personal repute, he may be summoned.

That it is not incompatible with unremitting musical study to find time to arrive at a state of proficiency in kindred pursuits, is evidenced by the number of musicians who now grace the musical profession by their varied accomplishments, which extend far beyond the actual confines of their strictly professional requirements.

No modern circumstance has so notably tended to enhance the reputation of the musical art as an intellectual vocation, and to raise its profession to the level of the so-called liberal professions, as the establishment of this Association of musicians and scientists, and the annual publication of its proceedings. Another important event in the modern history of the musical profession has been the incorporation of Trinity College, London, at which all branches of education, including music, would appear to be regulated by the highest scholastic standard. The increasing numbers of musical professors who, in addition to musical degrees, are taking other collegiate honours is another item of significance to be remarked in the actual superior educational status of the modern professor.

Celebrated musicians have acquired their technical knowledge and professional experience at various periods of the art's progress in many different ways. In former times, composers, who had already earned some degree of fame in their own country, were wont to resort to the then most renowned musical institutions of Italy, in order to extend the range of their observation by listening to the finest performances of Church and dramatic music; pursuing courses of counterpoint under the guidance of the then greatest contrapuntists of Europe; and refining their own style of composition by the study of Italian melody in the land of its inspiration. Numerous great masters have achieved their greatness through their own inherent energy. With a limited amount of positive teaching they have, by their own unaided efforts, solved complicated music-problems; have earnestly examined

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and analysed the erudite and enduring compositions of the music-classics; and have, by such means, educated their ears, poetically described as the "wickets of the soul," to receive through them every harmonious impression.

Exciting, pleasurable anticipations, more than sufficient to fascinate his imagination, are presented to the young musical student by the prospect of a continental musical training. A musical reputation legitimately acquired at a foreign *conservatoire* is doubtless of high professional value to a British musician. Not because he can procure there a more thorough knowledge of his profession, but because the foible of our countrymen and women to prefer things foreign to things native, more particularly in regard to music, yet obtains, although possibly in a somewhat milder form than when, in 1711, Addison wrote: "We are transported with anything that is not English; so it be of foreign growth, let it be Italian, French, or High Dutch, it is the same thing."

It is an acknowledged fact that a complete musical education is obtainable without departing from the shores of Great Britain and Ireland. It is undeniable that there are no better musicians, and no more efficient instructors in every branch of the art and science of music, than Great Britain and Ireland can produce. A first-class musical education is certainly more costly in this country than on the Continent, especially if acquired by private tuition from the best professors; but when the additional charges for travelling and living abroad are taken into account, the expenses may, in the end, be about equal.

The now venerable Royal Academy of Music, the parent musical academy of Great Britain, which, under the conduct of its accomplished principal, and an efficient professional staff, was never in a more flourishing condition, affords to students of talent and industry, at a comparatively moderate cost, valuable actual and contingent advantages. I can conceive no more desirable introduction to the musical profession than through the portals of the antiquated mansion in Tenterden Street. I presume that professional advancement and employment are assured to every distinguished pupil of the Royal Academy of Music. Advertisements daily invite attention to the respective special claims to public support of many more recently established musical academies, which are supposed to possess features of considerable attraction to many. Scholarships secure gratuitous instruction, besides a certain prestige, which is always associated with successful competition.

Young musicians whose tastes lead them in the direction of cathedral appointments should, I apprehend, attach themselves as early as possible to cathedral choirs, and thus gain a sound musical education, together with the mental training which may best fit them for the sacred musical offices of the Church. Many of our late most eminent Church composers, organists

and choristers, are reported to have qualified themselves for that serious department of the musical profession at what may be correctly termed the musical-seminaries attached to St. Paul's Cathedral, Westminster Abbey, and the Chapels Royal.

For a musician of reflection, and of intellectual resource, my beau-ideal of a musical professor's existence has always been that of an English cathedral organist. An accomplished musician of far-reaching attainments, relieved from pecuniary anxiety by an assured stipend; a gentleman respected and admired, in and out of his profession; visiting on equal terms his most worthy neighbours; away from the distracting turmoil of the work-a-day world; daily engaged in the performance of his sublime vocation; dwelling in a mansion of quiet, and surrounded by sacred associations, and soothing influences, under the shadow of a temple consecrated to his religious faith—a temple whose ancient monuments and venerated relics, breathing, as it were, religion, serve to recall the past and suggest the future—the cathedral organist, according to my view, enjoys in calm dignity the most enviable position to which any art-professor can possibly aspire.

I will now imagine a compact array of young organists, pianists, harpists, cellists, violinists, viola-*istis*, contrabassists, and wind instrumentalists, armed *cap-à-pied*, with their several musical instruments; male and female singers with well-tuned voices; and composers with an ample supply of music-paper, fully equipped, well-drilled, "their souls in arms and eager for the fray," impatiently awaiting enrolment in the noble army of musicians; in other words, seeking admission to the magic circle of the harmonious profession of music. Before its enchanted portals yield to the "Open sesame!" of the advanced guard, I will, as a professional elder, presume to offer to them, in all friendliness, a few words of counsel.

While hopefully entering upon his new, and, let us hope, promising career, it were unwise in the young musician to underrate the difficulties which he will have to encounter, the obstacles he will have to surmount, before he shall have reached the goal of his just ambition; viz., an undisturbed, undisputed position in his profession. Should he be gifted with genius, with its concomitant sensitiveness of character, fine mental organisation, and impassioned temperament—the common attributes of the genuine artist—he must gird up his loins, and arm his nature with finely tempered fortitude and resignation, to bear "the spurns that patient merit of the unworthy takes." He must school his mind and temper to submit, with a smile and a shrug, to petty slights, vexations, denials, indifference, ingratitude, sometimes rudeness, freezing neglect, disparaging—often unjust—criticisms from incompetent judges. He will perceive that only those who are

satisfied to remain in obscurity can hope to escape calumny, and the baleful effects of professional jealousy, envy, and all uncharitableness. When Petrarch, in 1341, received at Rome the poet's laurel-crown, he is said to have exclaimed: "This honour, which I have so long coveted, has served to set against me envy and jealousy. Every tongue and every pen has been sharpened to injure me, and those who were my friends have become my foes. My ambition has been satisfied at the cost of my peace of mind."

In our profession, as in others, we have high-minded, warm-hearted members, who manifest kind and affectionate interest in the professional advancement of young artists of talent; who inspire them at the right moment with generous words of comfort and encouragement; who offer them the friendly grasp of sympathy, which awakens slumbering energies, revives vanishing hope, and stimulates further active exertion to attain success. On the other hand, there are those upon whose unattractive features genial smiles of commendation are more rarely seen than repelling frowns of heartless disparagement; from whom scant sympathy is shown for the young musician who is toiling up the difficult, steep, and slippery ascent which leads to fame. Few professors of eminence, I apprehend, have escaped, at some period of their career, such varied experiences.

It is now time to consider some of the principal departments of the profession which present the means of earning an honourable subsistence. These will comprise music-composition, public and private vocal performance, solo and orchestral instrumental performance, and the wide field of teaching.

The British musician whose inclination and ability would lead him to the composition of high-class music, and who would thus vindicate his claim to take rank among the music-classics of Europe, must be prepared to produce his most ambitious works at his own pecuniary risk. Unless he be favoured by remarkable circumstances, which fall to the lot of very few musicians, he will find no other means of making his compositions known to the public by performance and publication. In his efforts to induce musical societies and individual concert-givers to perform his best works, he will be met on every side with bland denials, brusque refusals, obstructions and obstacles, more than enough to damp the ardour of the most hopeful and enthusiastic musician.

By means of a magistrate's search-warrant innumerable meritorious compositions, which may have lain dormant in the gloomy cabinets of unappreciated genius, might be brought to light, oratorios, operas, symphonies, overtures, concertos, cantatas, toccatas, and sonatas—yet unheard and unheard of—whose musical sweetness, long wasted on the desert air, had it been wafted into the unprejudiced ears of an appreciative

public, might possibly have tended to exorcise that grim incubus of the British musician, viz.: the inane prejudice of English men and women against the native music of their own country.

The composition of drawing-room pianoforte music, of moderate difficulty and pretensions, was once a prolific source of profit to the popular pianist and teacher. There was a time within the memory of many here present when airs with endless variations, fantasias, capriccios, divertimentos, arrangements and *de*rangements of opera cavatinas, furnished employment to the writers, the publishers, the teachers, and the pupils of those days. That item of professional emolument has become a kind of extinct volcano. Now the supply of new, melodious, and well-composed music for the pianoforte is not equal to the demand. The discriminating section of the musical public have become cautious in purchasing pianoforte music which does not bear the signature of a well-recognised name, or which has not attained notoriety by its public performance or by wholesale advertising. Publishers now look upon music-publication as a kind of lottery, in which prizes are less common than blanks; and they have consequently almost ceased to speculate in the purchase of modern pianoforte music, preferring rather to import and publish the non-copyright works of the advanced German school of composers; which, although sometimes unpleasing to the educated musical ear, are accepted with complaisance, and even with admiration, upon the strength of their supposed originality and their foreign origin.

In no other country is a certain class of solo vocal music as profitable, alike to the composer and publisher, as in England. Its success, in the majority of instances, may be attributed to the continuance of the baleful "royalty" system, whose inherent unhealthiness will, it is to be hoped, bring it ere long to an untimely end. Unlimited advertising is another prominent feature of illegitimate success.

The courageous British composer, whose dramatic proclivities may tempt him, in these Wagnerian days, to storm the citadel of English grand opera, would do well to remember the portentous inscription over the gate of Dante's "Inferno":—

Lasciate ogni speranza, voi che entrate!

Following in the wake of the many popular French musical extravaganzas, which of late years have attracted public attention in all parts of the world, the tide of popular favour in this country has been for some time past flowing with a rapid current towards the whirlpool of "Sorcerers," "Pinafores," and "Penzance Pirates." When all the changes of that class of dramatic music shall have been rung; when satiety shall set in, and the risible machinery of the British public shall require

repose from an exuberance of cachinnation, a more healthy operatic taste may again prevail, and we may once more hope to see the British dramatic composer expending his talents in the production of high-class operatic music, which shall be sung by British vocalists, directed by British conductors, and applauded by British audiences.

To the young and yet unknown singers of both sexes, who naturally seek public recognition of their talents at high-class concerts, at oratorios, and upon the operatic stage, the difficulty of obtaining opportunities to be heard is every year becoming greater. With perhaps a few exceptions, the principal and best paying concerts are in the hands and under the direct influence of music publishers, who seek to make them the medium of giving to their own publications a wider circulation, and who, as a rule, remaining constant to a small staff of singers and instrumentalists of established fame, have no engagements to offer to "outsiders." Even with powerful personal influence it is hardly possible to obtain entrance within the charmed circle of either old or new musical societies as paid vocalists or performers. This state of things is very disheartening, and discouraging to those who seek to gain a livelihood by the exercise of their musical talents, and who have with that view alone entered upon a professional career.

The paths to celebrity, and consequent professional employment, are easy and rapid to those upon whom the press and the public have stamped their hall-mark of approval. Others, whose abilities have yet to be recognised by the same powers, must be hopeful, patient, courageous, and ever industrious, neglecting no opportunity to deserve success, and, supported by a modest self-consciousness of strength, be ever prepared to fill unexpected vacancies, which are often the stepping-stones to high professional advancement. Many talented singers and performers, who are seldom or never heard in the metropolis, nevertheless obtain provincial engagements at concerts and oratorios. Their fees, although moderate in amount, are generally sufficient to enable them to wait for more lucrative engagements in the metropolis and elsewhere.

Foreign musicians, who come to settle in this country, probably unaware of the favourable opportunities for establishment in some of the populous manufacturing cities of the north of England, have formed no idea of any other residence than London. More than twenty years ago, a very talented musical professor of Rome brought to me from that city some earnest letters of recommendation. He came with the intention of becoming a resident London Italian singing-master, as he was led to expect that guineas were as plentiful in London as blackberries; that, in fact, they might almost be picked up in her streets. He did not remain long under that delusion. He succeeded in gathering a few pupils at a half-guinea per

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lesson. This did not satisfy him, and he became impatient. Notwithstanding he gave a successful concert at a private mansion, pupils did not flock to him as he had expected, and he consulted me as to what he should do to obtain pupils. I counselled him to seek a connection in a wealthy city in the north of England, and he availed himself not only of my advice, but of some introductory letters. On arriving at his destination, he wrote upon his cards, "Italian singing-lessons by Signor ———, from Rome, one guinea each at the maestro's residence; at the pupil's home, *terms half more high.*" He had not to wait long for pupils. He was then an excellent teacher with a good tenor voice, and soon obtained a profitable connection. As a bachelor he lived economically, saved money, and in a few years retired with a moderate but sufficient income. I counsel others to do likewise.

Music-teaching in this country is acknowledged to be the chief and most lucrative branch of the profession of music. It is that in which the great majority of musicians are mostly engaged. To those who are blessed with a highly sensitive temperament, lesson-giving, to ordinary pupils, is not an agreeable occupation. Wearing to the nerves, trying to the temper, it strains patience to the utmost limit of human endurance. Were a new tariff for musical instruction to be arranged, I would be inclined to price music-lessons to those most deficient in musical comprehension, borrowing the quaint phraseology of my old Roman friend, "terms half more high." In other words, the most stupid pupils should pay the highest terms. The late Sir George Smart was wont to exclaim, with his peculiar nasal twang, "Give me your stupid pupils!" He preferred them for the obvious reason that they remained longer under his tuition. The ability to appreciate, and to benefit by sound musical instruction, is hardly less a gift than the special talent essential for imparting it agreeably and efficiently. All those who have given instruction in music will agree with me that it is an indescribable pleasure to meet with a pupil of quick apprehension, with warm musical sympathies in unison with one's own; and that if to live were not a necessity—a truism which a famous French statesman would appear to have denied—one might choose to receive fees from such pupils in the coin of gratitude rather than in the current coin of the realm.

The establishment of ladies' colleges has much revolutionised the teaching department of our profession, inasmuch as the branch of lesson-giving called "finishing lessons" has, to some extent, become a dried-up professional stream, as compared with the profitable produce of private teaching in the halcyon days of the musical profession, when in this country there flourished Clementi, Dussek, John Cramer, Charles Neate, Moscheles, Ferdinand Ries, Kalkbrenner, Madame

Dulcken, Mrs. Anderson, and many other eminent pianists of bygone days. The British public now require cheap lessons to be administered upon homœopathic principles—in minute doses at long intervals. By a patent process of recent introduction, pupils of every age and degree of ability are now supposed to be "finished" by the minute, meretricious, meagre, musical nutriment of twenty-five minutes teaching once per week during a musical-academy term of ten weeks. Yet more extraordinary results are promised to the credulous and confiding in many advertisements that daily meet our wondering gaze.

School-teaching, which once formed an important item in the professor's income, being comparatively certain and to be depended upon, has, at length, from many causes, become doubtful and insecure. Indeed in every branch of the musical profession noteworthy changes have been for many years perceptible, and to the close observer indications of further changes are clearly discernible, which, I am inclined to think, are not favourable at the present time, or promising to the future of music and its profession. These unfavourable, unpromising changes may be traced to increased and increasing competition, the admission to the profession of too many superficially educated musicians, indifference to sound instruction, a glut in the market of commonplace, inferior musical publications, cheap lessons, revolutions in national habits and taste, rapid locomotion, and the ordinary mutations to which all things in nature and art are liable.

In "the good old days" of the musical profession, almost every musician of eminence gave his annual "Benefit Concert," and by that means added more or less to his income. His tickets of admission were priced at a half-guinea. Reserved "sofa stalls" had not then been invented. Those who added a band to their vocal attractions usually lost money. The public, as a rule, care little for orchestral concerts. They are nearly always failures, in a pecuniary sense, unless supplemented by powerful popular vocal talent. Concert-giving, therefore, is now a lost item in the modern professor's income. It is in the present day a question of more or less loss, not, as formerly, of more or less gain.

Unless aided by lucrative offices, or by private resources, musicians have not often had it in their power to lay up pecuniary stores for their support when overtaken by illness, old age, infirmities, and the numerous ills "which flesh is heir to," much less for the provision of their families after their decease. England is unhappily wanting in such appointments as were held in Germany by Bach, Hummel, and other famed composers, which assure a moderate stipend for life to the musician who may have been compelled, from the bent of his genius or from uncontrollable circumstances, to work in an unproductive field

of his art, and enable him to indulge his leisure hours at the close of life in a sufficient degree of professional *otium cum dignitate*. The musical professor of distinction who, in this country, would insure respect and remunerative professional fees, must pay strict attention to his external appearance, as regards his domestic economy, and his general household and personal condition. In order to satisfy the prying curiosity of the outer world in such matters, he may often be compelled to tax to the utmost his limited pecuniary resources. England too often estimates a professional man's status by the amount of his fees, and by his demeanour. His terms, unfortunately, do not increase in the same ratio as his house-rent, taxes, food, apparel, and the education of his children. The unmusical world not unfrequently indulge in the luxury of music at the expense of the professor, to whose necessities it is coldly insensible; whose engagements, being dependent upon the state of his health, upon the fickleness of fashion, the caprice of the public, and upon unexpected circumstances beyond his control and calculations, are ever uncertain. The amount of inconsideration which a musical professor occasionally experiences from his noble and wealthy professional connections, would scarcely be credited by the inexperienced. There are some few musicians, notably popular singers, who are in the receipt of large incomes derived from engagements, and from "royalties" paid upon songs which they themselves may have rendered popular. There are others who earn moderate incomes. But the majority of musical professors, of both sexes, find it sometimes a hard struggle to support themselves and their families, with ease of mind and comfort of body.

Philanthropy has always been a characteristic feature of the profession of music. No other, with perhaps the exception of the medical and actor's profession, has done so much to alleviate distress and bestow substantial comfort upon the unfortunate. Individually and collectively, musicians, in every department of the profession, have been always ready, upon every summons, to exercise their talents gratuitously in furtherance of charitable objects. Music and charity have so often been thus intimately united that they may be almost claimed as synonymous expressions. Bearing this fact in view, I would avail myself of this favourable opportunity to remind all who love music and respect musicians; all who have derived, and yet derive, enjoyment from their efforts, all who sympathise with musicians when their powers fail them, that there exists in this great city a blessed institution, dedicated to Music and Philanthropy, which annually distributes thousands in solacing the declining years of the aged and incapacitated musical professor; in providing sustenance for his widow; in educating his orphan children, and setting them out in life. This noble institution, entitled the "Royal Society of

Musicians," associated with the illustrious name of Handel, is justly the glory and pride of the British musical professor.

My personal experiences of our profession having been gathered more in the metropolis than elsewhere, I have thought it discreet to limit my observations principally to its practice in this city. Much has to be related of the life, duties, and emoluments of the country professor, which, it is to be hoped, will be supplemented by those whose provincial experiences will be prized and gladly welcomed by young professors, who may be hesitating as to the locality in which they may find it most desirable to establish themselves. An interesting topic for comment and interchange of opinions would doubtless result from considering the relative position of the London and provincial professor.

Now as to the general aspect of the musical profession at the present time in this country.

In proportion to the population of the past and present, more persons now learn music than formerly. The number of musical institutions of all kinds, academies, colleges—private and public—has considerably increased during the past few years. An immense amount of music is continuously issuing from the presses of publishers—new editions of standard works at marvellously cheap rates, and other musical publications at expensive prices. We have in our midst highly talented professional and non-professional musicians. Choristers are now to be counted by thousands who formerly were numbered by hundreds. Music and musical instruments have become a large and important item of commerce; indeed, music, in various ways, may be almost claimed as a staple necessity. Music and musicians are to be seen and heard everywhere. In Great Britain and Ireland, music, as a profession and a trade, furnishes the means of living to about eleven thousand persons, four thousand of whom reside in and about the metropolis. Exclusive of pianoforte-players and organists, I find, in "Reeves' Musical Directory, for 1880," the names and addresses of nine hundred singers, and about twelve hundred and forty-four instrumentalists. This can, of course, be but an approximate computation.

According to the authority I have named, there are resident in Great Britain and Ireland 570 violinists, 90 viola-players, 112 violoncellists, 67 contra-bassists, 70 flautists, 17 oboeists, 14 bassoonists, 45 clarinetists, 18 trombonists, 10 trumpeters, 24 horn-players, 17 euphonium-players, 91 cornet-players, 33 concertina-players, 60 harpists, 27 guitarists, 4 players on the bombardon, 6 on the flageolet, 8 on the banjo, 1 on the contra-fagotto, 1 on the seraphine, 1 on the bones, and 1 on the tin whistle. Organists and pianists are beyond my calculation. I have made no attempt to number them.

Having made my first bow before a British audience, and

published my first composition in 1828: having, during a long professional career known more or less intimately most of the musical celebrities: having heard all the best singers, all the best performers, and all the best music during the past half-century, I venture to form an opinion of the present condition of the musical profession, with reference to the art's progress and the financial status of its professors. Comparing the present with the past, my view, I regret to state, is not a favourable one. I shall be glad to learn that my unsatisfactory estimate of our profession at the present day is incorrect, and that, from positive evidence, the musical profession and the professor may be considered to be in a flourishing condition, and moreover that a satisfactory future may be anticipated.

DISCUSSION.

The CHAIRMAN, having proposed a cordial vote of thanks to Mr. Salaman for his interesting paper, which was unanimously carried, invited discussion on the subject.

Mr. W. H. CUMMINGS said Mr. Salaman had touched on a great many subjects, on most of which he had formed some opinion, but it would occupy even more time to go through them all than the reading of the paper itself. In one part he spoke of the difficulty which professors, both male and female, found in acquiring anything like a competency, or putting by money for the future; and he, as treasurer of the Royal Society of Musicians, begged to thank him for the warm way in which he had spoken of that institution, and also to express a hope that the words he had uttered would produce some fruit, and that those who had not heard of that Society before would make themselves conversant with its operations, and give it their support. It only gave money away to those who absolutely needed it, but each year it spent nearly £4,000 in alleviating some of the distress which was brought before it, but it was not by any means a tithe of that which existed. It was evident, therefore, that the Society needed all the support it could receive. If all the ladies and gentlemen who attended concerts at St. James's Hall or Exeter Hall would only tax themselves to the extent of one shilling for each concert they went to, that Society would be able to extend its benefits much more largely than it could at present. Mr. Salaman had painted a very pleasing and beautiful picture of the condition of a cathedral organist. He could not see any representative of that body present, but having been connected with a cathedral from a very early age, he knew something of their position, and he feared a large portion of the description must be considered as of rather a poetical character. Looked at in the abstract, he himself should suppose that a cathedral organist's

position must be one of the most enviable in the whole of Christendom. He generally lived in a charming city, under the shadow of a beautiful old building full of historical associations, and he ought to be the most happy of mortals; but unfortunately there came in this practical question, that he had to live, and he must say that he feared cathedral organists were not very well paid; therefore, when he found his dinner-table was very shortly supplied, and his butcher's bill more than he could readily meet, a good deal of the poetry was driven out of the picture. What he felt about the future of the musical profession was this—that no one who had real ability, industry, and enthusiasm, need fear. He believed that those who had plenty of ability would find that when the mutation of things shut up one door it would open another. He himself had had considerable experience, and had changed the mode of earning his living in various ways, and yet he did not feel that he suffered. Without going too much into personal matters, he might say that, from his own experience, he felt that if students only first of all ascertained that they had real ability, and would industriously use it to make themselves thoroughly efficient for their future work in life, not as mere singers or pianists, for that was only half a musician after all, but if they would endeavour to qualify themselves to become thorough musicians, they had as fair a right to expect a good career as most other professions. Of course, music suffered in common with many other arts from the fact that amateurs might interfere with it. Amateurs could get St. James's Hall, sing so many songs, &c., and probably by that means keep out professional singers; but there was another side to that question. If the amateur, by stepping into the concert-room, took away bread from the professional singer, on the other hand competent musicians would be required to teach these amateurs to sing, and, therefore, if they lost on one side they gained on the other. He thought that no talented musician, who was looking to music as a profession, need despair. If they qualified themselves thoroughly for their profession they would find work to do.

Mr. G. A. Osborne said Mr. Salaman had referred to the somewhat remote age to which he himself belonged, and he remembered, as a professor, in that period he came over to London occasionally from Paris, where he then resided, to give his concerts during the season. For two or three years they were given in the Hanover Square Rooms; price of admission, one guinea. The room was then crowded, but not with guineas. After a few years he had to give concerts with the price of admission a half guinea, and a family ticket to admit three, one guinea, but his experience was that all the families consisted of one person, and consequently, therefore, he did not benefit by the change. He prided himself on being some-

what of a physiognomist, and he thought he could always tell who were those who paid and who did not. There was a kind of a financial apologetic expression about the countenance of a person who paid. He looked as much as to say that he ought to be there by invitation, and was very sorry that he had paid. He must say from his recollection that concerts at that time were not in that flourishing condition, in a pecuniary point of view, that Mr. Salaman had described, but were pretty much the same as they were at the present day. Sometimes you met a composer who had got a very fair share of British money, and perhaps he might say that he was one; but it sometimes happened that this occurred by mere accident, to illustrate which he might mention a circumstance which happened to himself. Many present might know the piece called "La Pluie de Perles." He wrote that piece in Paris, and sent it over to Cramer's. The manager wrote back to say that it would be better to send some pianoforte piece on an Italian opera; but he would enter this at Stationers' Hall as Mr. Osborne's property. He did not send a piece at that time, and took no more notice about it. A year afterwards he came to London, taught "La Pluie de Perles" to several pupils, and, after about a year, when asking for his account at Cramer's, he found there was a charge for entering a piece at Stationers' Hall. He said that was not correct, as he had not the copyright of any of his pieces; however, they insisted that it was, and although the piece could have been had originally for £10, Mr. Beale then offered him £250 for it. He said he must first be certain that it was his property, and having sent to Stationers' Hall, and consulted Serjeant Byles, who was an authority on these questions, and found that it was so, he returned, but, instead of selling it to Messrs. Cramer, he went round to all the publishers, and sold it to twelve out of fourteen, who had brought it out, for £10 each. By this means he sold it for £120, instead of £250, but he made every publisher his friend, and by that mere chance he eventually put between £5,000 and £6,000 into his pocket. Like Mr. Cummings, he was rather charmed with the description of cathedral organists. It was a most honourable position to be organist of a cathedral. He heard the very best works there; his body was well cared for, having plenty of exercise, both on the pedals and in pulling out the stops; and not only so, but his spiritual wants were also ministered to; for, besides the great festivals, there were fifty-two weeks in each year, and consequently he had the advantage of hearing one hundred and four sermons.

The Rev. Thomas Helmore, M.A., remarked, with reference to the question whether amateurs interfered with the profits of the profession, that very early in life it was his pleasure to take lessons in a provincial town, from two members

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of a well-known family named Marshall, on the violoncello and pianoforte. When he left Stratford-on-Avon he left Mr. Frederick Marshall as conductor of a musical society, which he had raised there, with a stipend of £50 a year, which was raised in consequence of the labours of himself and others as amateurs; and he could only say that Mr. Marshall's opinion was that it was the amateurs who provided for the musicians. He might say that throughout life, as far as he was concerned as an amateur, he had conscientiously endeavoured as far as possible to aid in the support of the profession; not take away from it anything which was its due, or to allow the work of amateurs to impinge in any way on the ordinary gains of the professional man. All amateurs ought to act in that spirit, and he believed many did, and there was no doubt that the wishes and wants of the amateurs in the way of teaching provided a great deal of employment for professional men, which otherwise they would not have.

Mr. ORLANDO STEED said that Mr. Salaman had called forth quite a burst of merriment, by an allusion in one part of his paper to the infelicity of teaching, and it seemed to be a generally understood thing that, when musicians condescended to give lessons, they were putting themselves into a very unpleasant position. He thought they ought not to take that view, nor ought they to expect always to have very clever pupils. Lesson-giving ought to be a real pleasure to a musician, and might be so if he only learnt properly how to teach. The great want in teachers was not musicianship so much as the power of imparting thorough instruction in music. He was quite certain that even so-called stupid pupils were generally amenable to sound instruction. Teachers should especially give attention to understand the principles of touch and voice production. The greater number of lessons given in this country were in the arts of pianoforte-playing and singing, and he was quite certain that a so-called good touch on the piano was not half so much a gift as the result of proper training. He himself had a few lessons some time ago from Sir Sterndale Bennett, who, when he went to him first, told him, after some complimentary remarks on his reading, that he had no touch at all, but, seeing he was somewhat taken aback, he added, "Never mind, Mr. Steed; I can give you a good touch." It was not for him to say what the result was, but he was quite certain that any pianist who studied the principles of education, the conformation of the hand, and the idiosyncrasies of his pupils, would be able to make them thoroughly efficient players. The same thing with regard to voice production. If they only knew in what the true principles of voice production consisted, they would be able to make very fair singers indeed, even from those who apparently had no voice at all. He had come across many

amateurs taught by distinguished musicians who could not play at all, and he could only attribute it to the fact that those musicians were not strictly speaking teachers. He thought it very important that the younger members of the profession should be told distinctly that if they meant to get a living by teaching they must study the art of teaching, and must enter into it *con amore*, not as if they were simply doing it for their living; but they should become enthusiastic teachers just as they might be enthusiastic composers and players. He did not quite understand what Mr. Salaman said with regard to modern German works being non-copyright.

Mr. SALAMAN said that he referred to works whose copyrights had expired, and which, consequently, any publishers in this country had the right to produce. There were many compositions published on the Continent, the copyrights of which have never been secured in Great Britain. Mr. Salaman had hoped that there were points in his paper which would have elicited a greater amount of discussion and information, especially with respect to the condition of the provincial professor. The musical profession was a prolific subject, and if all were written which might be said upon it, a volume might be produced. He hoped that there were some topics in his paper which, on a future occasion, might lead to another discourse from another member, whose experience in some special departments was greater than his own. Perhaps his fancy had too highly coloured the picture he had painted of the cathedral organist. When young he was much with Mr. Angel at Wells, the then assistant and officiating organist, and Dr. S. Wesley at Exeter; and he had formed his estimate of the cathedral organist's position at that time, some forty-five years ago. It then appeared to him a most enviable one. No doubt many disagreeables were hidden from his view, such as controversies and inharmonious considerstions, which might have become known to him had his experience been more continuous and later.

The CHAIRMAN said there was a paper, which he had been told had originally appeared in a Parliamentary blue-book, on "The Condition of Music in our Cathedrals," by Dr. Wesley, who had just been referred to. It was reprinted and published by Messrs. Rivington, and, though he had not seen it for some time, he had a perfect recollection of its power and truth, and should recommend its perusal to any one who might be interested in that particular point of Mr. Salaman's paper. Of course, there were advantages and disadvantages to be found in every possible position in a profession like that of music, and it might be quite true in theory that the position of a cathedral organist was as acceptable a one as a musician could be asked to hold; but when they came to know the miserable payments made to cathedral organists

throughout the country, it would be to every one, as it had often been to him, matter of astonishment that so many estimable men and first-rate musicians were willing to occupy these posts. When they saw how small a modicum of the cathedral revenues throughout the country went into the pockets of the principal musician of the diocese, he certainly thought they ought to revive Dr. Wesley's protest, and, if possible, influence such a body as the Ecclesiastical Commissioners to do something like justice to these ill-paid functionaries.

A vote of thanks to the Chairman concluded the proceedings.

June 7, 1880.

W. H. CUMMINGS, Esq.,

In the Chair.

THE LYRICAL DRAMA.

By G. A. Macfarren, Esq., M.A.,

mus doc cantab., prof. mus cantab

When the subject of this address was decided upon, I had an idea that I might bring before the attention of this meeting many unfamiliar facts in connection with a most important, possibly *the* most important, branch of musical composition; but in the interim there has appeared the beginning of an article in Mr. Grove's Dictionary—which, although it is not yet signed, I guess from internal evidence to be the production of Mr. Rockstro—which anticipates many of the novelties I might have advanced, and sets those forth in the most clear, in the most interesting, and (I can say nothing short of the highest terms of eulogy) the most satisfactory and instructive light. I can with the fullest confidence refer persons who are attracted to the subject to that article, which, in supplying many dates which are difficult to recollect in a *vivâ voce* enunciation, and many unfamiliar names, will be of very great service as an authority, and will, I am certain, repay anybody's attention and careful reading. If the article continue as it has begun it will give to the world a concise, but a most valuable, history of the course of the lyrical drama.

As to the lyrical drama itself, we must first regard the familiar objection that, as mankind do not sing their sentiments, the dramatic representation in music is wholly artificial and apart from nature. Being artificial constitutes it a work of art, apart from nature, in so far as it is not a *fac-simile*, but true to nature in so far as it is the heightening of the realities of ordinary life, and heightening them with the bright colour of poetry. It is the province of art to heighten and to brighten, to embellish and to beautify the facts of nature. It is Bacon who has stated that there is no such means of enforcing a lesson as by presenting it in living action, and thus the drama in itself is a most powerful means of instruction. I think it is a happy omen for the coming time that the best authorities

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seem now to entertain this view of the drama. The institution of the Society for Dramatic Reform, the many speeches of distinguished men of letters, and distinguished theologians at the meetings of the Social Science Congress, on the great importance to the world at large of dramatic production and dramatic performance, show that the greatest minds of the time are taking the possibilities of the drama into earnest consideration.

If a work of art were to be limited to the realities of the world, a looking-glass might stand in place of a picture, a police report in place of a tragedy, and music would drop out of being entirely. But it is in a picture, as distinct from the reflection in a mirror, that one sees nature through the mind of an artist. It is in poetry that we can enter into the feelings of men through the representation of an artist's imagination; and music expresses those feelings more forcibly than words can utter them, more delicately, more intensely; and if the hearer have the perception which can rise to the fullest power of the work addressed to him, he may find in musical expression the grandest presentation of the feelings of man. The drama "holds the mirror up to nature." Music is that mirror, with such spectral phenomena as show nature in a beautified aspect.

The lyric drama is the most ancient of all dramatic representation. It is attested that Æschylus composed the music for his own tragedies. That those tragedies were musical throughout there can be no doubt, the dialogue being, as we should now describe it, chanted or intoned upon some prescribed arrangement of musical notes, and the choruses which intersperse this dialogue being set to more formal music. This identity of musician and poet, constituting a two-fold "maker," was not continued in the case of subsequent Greek tragedians. It seems not to have been with Sophocles and Euripides as it was with Æschylus; and although it has been rarely that the musician and the literatist have been combined in the same person, there have been instances in after-times where this has been the case, and it must be maintained that if the lyrical drama is to be at its best it must be the result of concerted work between two persons, if two are concerned in it. No musician can do himself, or his work, or his art justice who shall take a stereotyped libretto without the power to extend, or contract, or alter, or diversify it, according to the exigencies of his own view of the subject; and thus it will be found that where the musician-composer has not been also the text composer, in the best instances, his poet has played into his hands, and modified the situations of his drama and varied his text according to the musician's casual requirements.

The principle of the Greek drama was continued in Christian times in a very remarkable and signal instance; that was a

religious rite to keep alive in memory the men and their deeds which were held sacred, and this, of which it is now to speak, appropriated the same means to the same end when persons and facts of another character claimed reverence. Gregory of Nazianzus, a town in Cappadocia, wrote a tragedy upon the Greek model, embodying the story of the Divine Passion, in which the chanted dialogue was interspersed with choruses; and we have at the present moment a genealogical descendant from this drama of the fourth century in the "Passion Play" represented every ten years at Ober-Ammergau, save that the musical element has dropped out of the play, and the dialogue of the present day is spoken instead of intoned. Subsequently to the tragedy by Gregory, in the miracle-plays and the mysteries there was always incidental music, but not music connected with the action—music interspersed more or less to illustrate the situations or the sentiment of the text, but not to be necessarily or at all concerned in the presentation of the incidents.

We find, however, in the fifteenth century, a drama on the subject of "Orfeo," by Poliziano, for which Enrico Isaaco, I believe of German birth, wrote music in Italy, but little or nothing as to the musical merits of this work has reached us. In the English drama, subsequently to this, music was introduced episodically, but with such seeming necessity for the satisfaction of the audience, that there are not a few instances where personages are brought on to the scene for the sake of singing their song, and not for fulfilling any incident in the story or taking any part in the action; such as the appearance of the two pages in the fifth act of "As You Like It." They enter to Touchstone and Audrey, and, at the invitation of these two, sing "It was a lover and his lass;" and having sung and having received the comment on their performance they leave the stage, and then the action goes on as if it had not been broken by their presence. This is, I think, an evidence that the audience of the time wanted the embellishment of music in the course of a long dramatic performance. More directly connected with the action of the scene is the music of the Witches, introduced in Macbeth,' and this music, with the doggerel text to which the greater part of it is set, was previously in the play of "The Witch," by Middleton, and it had attained such general esteem that when "Macbeth" was to be produced it became almost a necessity, or Shakespeare must have felt it as an entire necessity to surround his Witches with music, because this class of being was in the public mind thus associated, from the success of this preceding play; and no music could so well fulfil his idea as that which already existed, and the verses to which this music is set were transplanted entire into the great tragedy of our greatest poet.

Now comes into consideration the real foundation of the modern opera, and this has an intimate connection with that great movement for art, the Renaissance. Letters, paintings, sculpture, had received already the benefit of the revival of classic principles, and then it came to be considered that the same view might be applied to music. The tradition was extant—nay, we have written evidence—that music had been the most powerful means of impressing on the audiences of the Greek theatre the poetic power of the plays. The music of the period at which we have now arrived, namely, the end of the sixteenth century, was either the scholastic music now described as polyphonic, of which a very main interest lay in the imitative nature of the part-writing, or else the music of the people, which may be best described in our English idea of the ballad, that is, the recitation of a story to many, and many repeats of one very concise melody.

Now from those two styles of music, declamation and expression of the poetry were necessarily excluded. In the fugual, or canonic, or imitative style, which prevailed as much in the madrigal compositions as in the music for the church, it would be impossible to express or to declaim words, since the many voices would be singing different words at the same moment. In the ballad, there could be small expression in a tune that was to be again and again repeated through a long and various story, which might comprise incidents of gaiety, of gravity, of regret, and of rejoicing; and the utmost that could either be in the ballad-tune or in the polyphonic composition of embodying character, would be a general resemblance to the nature of the subject, but by no means to the proper declamation of the words.

Then a society of gentlemen, men of letters, lovers of art, was formed in Florence. Count Vernio was at the head of this. Vincenzo Galilei, father of the astronomer, and a nobleman of the name of Corsi, were among his associates. These formed the idea of restoring to music that declamatory character which it is supposed to have held in the Greek tragedy. They employed a poet, Ottavio Rinuccini, to construct some verses with a view to their musical declamation, and they engaged, at first, two singers, Giulio Caccini and Jacopo Peri, who were, from the point of musical composition, little skilled, but were well adapted for the task proposed, from their habit of singing and from a singer's point of view regarding the exigencies of the words, and the capabilities of the voice for vocal expression.

You, sir (addressing the Chairman), and many other persons here, can very well estimate how important it is to one who undertakes the task of setting poetry to music to feel this singer's quality in approaching his subject, and from a singer's point of view he may be able to do a higher justice to his music and to his verse than any one could who had not the

habit of singing or the experience of listening to singers. It was in 1590 that the first productions of these singer-composers were privately performed, at the house of the gentleman I have named.

Then also came upon the scene Emilio del Cavalieri, a Roman by birth, who was an educated composer; and he brought to the task a theoretical knowledge of musical principles. Now it is to be considered that this term "lyrical drama" is not necessarily, or by any means, limited in its application to secular subjects; and whereas the performances of Peri and Caccini were in the first place monologues, Cavalieri wrote a continuous drama, interspersed with dancing and action, which was represented with acenery, and which was not on a Biblical story, but on a religious theme. "La Rappresentazione di Animo e di Corpo" was performed in the oratory of a church, and classes at the head of the dramatic oratorio, distinct from didactic oratorio,—this being exemplified in works at present familiar by the "Passion" of Bach and the "Messiah" of Handel, whereas specimens of the dramatic oratorio are many other works of Handel, which are always described by himself with the epithet "oratorio or sacred drama," such as "Samson," "Judas Maccabæus," and "Jephtha." The composer last named had so keen a sense of the dramatic treatment of his subject, that he wrote always in his scores such stage directions as would be given for a theatrical performance of the works in a theatre, describing the entrances and exits of personages, and other actions bearing upon the conduct of the story. Many and many such instances are to be found throughout the MSS. of Handel, although they are, I believe, always omitted in the printed copies of the music. They are still, however, to be found in some of the separate librettos, and I think they clearly show how strong was his sense of the scene, although he wrote with the view to his pieces being sung without the adjuncts of theatrical effect.

Another composer, who was also a cultivated musician, and who had already gained great celebrity by his composition of madrigals, but greater celebrity by his introduction of some important new principles in musical theory, was Claudio Monteverde, a man of the highest note in the history of art, as having been the first person who felt the natural basis of music as distinguished from the artificial rules, which up to the time of his appearance on the scene of history had always prevailed. He it was who first employed what must be called the natural discords—those discords, namely, which, consisting of the notes of the harmonic series, are naturally produced, as distinct from those other discords which can only be satisfactorily heard when their harshness is mitigated by the formula of preparation. These let us call artificial discords;

those which Monteverde originated, natural discords. And modern music may be said to date from his first use of the chords in question, the best known of which and the most used is that ever-ready chord of the dominant seventh; and when once the principle of its use was understood an entirely new field was open in the range of the composer's art, and all time since has been most valuably, most beautifully engaged in the cultivating of this field. And how great, how noble, is the harvest it has yielded! Must we not feel that the mind of the artist is the virgin mother, from which proceeds the divine child, that, passing through the world, bears its burden of beauty, and this is scattered freely among those whose hearts of faith enable them to receive and perceive the bounty that is offered them?

Monteverde composed first an opera called "Arianna," of which but a small fragment remains. This was in 1607. It had a very great success, in consequence of which, and by its encouragement, he wrote in the following year an opera which has been preserved entire, having been contemporaneously printed, "Orfeo." The work is highly remarkable in the fact that it employs a very large number of instruments, that it not only aims to declaim the words and portray the dramatic situations, but to characterise each individuality of the action, and distinguish Orpheus from Eurydice, both of them from Pluto, and every other person in the drama; and it is remarkable as giving us the oldest extant attempt at what we now call an overture—an instrumental prelude. A most remarkable piece is this said prelude, comprising nine long bars directed to be played through thrice, and entirely consisting of the one chord of C from the commencement to the end. This would seem an extravagance, but there is a composition which but a few years ago was first publicly performed, and which has drawn the attention of many musical critics and the admiration of some, that has for overture what amounts to five pages of pianoforte arrangement, and consisting wholly and exclusively of one chord of E♭, which is mostly dispersed over the melodic figure that is employed conspicuously in Mendelssohn's overture to "The Beautiful Melusine." I was once present when an admirer spoke of this composition as sublime, and a bystander said he thought it went a step beyond. However, that is by the way. It is only to show that Monteverde, in his originating the overture, in his having a large orcheatra, in his intermixture of chorus and solos, in his giving substantial characterisation to each person in his story, indicated, although not in those early days fulfilled, but indicated all that dramatic art can fulfil in music.

Shortly after the time of Monteverde appeared a Venetian of great merit, whose name is familiar as Cavalli; but this is an abbreviation or pet name given by the world, and is not his

real patronymic. He had very great success in Venice, and seemingly from very great desert, and so great was his success there that he went to Paris after a time, to reproduce some of his works.

Having named Paris, we now come to a very important phase in the history of the musical drama. We have to speak of Giovanni Battista Lulli, a born Florentine, who went to Paris as a page to a princess when thirteen years old; who, because of his ugly face and awkward manner, was thought unfit for the position to which he was called. He was driven into the kitchen to act as scullion, but so greatly entertained his fellow-servants by his performance on the violin, that his fame for musicianship rose upstairs; and here really may be felt to have been an illustration, or an anticipation, of true "high-life below stairs," since, with Lulli in the kitchen, there was a higher art than was to be found in king's chambers. Lulli was called to take part in the music of Louis XIV., and such excellent part did he take that a separate band of twenty-four violins, which I suppose must have included the bass-viol as a branch of the violin family, was appointed for him to direct, for him to teach, and for him to write for. One result of this was that when Charles II. returned to his throne in England, after his sojourn in the Court of Louis XIV., he set up also his royal band of musicians, also consisting of twenty-four, with John Banister as its leader; and from that may doubtless have come down to us the nursery lines of "Four-and-twenty fiddlers all in a row." Now before the King it was very frequent to have performances of ballets. There had been in the latter part of the sixteenth century ballets interspersed with choruses performed before the Court, and Lulli was engaged to compose the music for a continuation of this line of dancing dramas.

It is worth while to rest here a moment on the somewhat remarkable fact that whereas France is regarded as the centre of taste—fashions are drawn from France, and our standard of likes and dislikes is placed in the French capital—the French themselves have in a remarkable degree referred to Italy for their music. Thus, the origination of the French opera springs from those ballets for which Lulli composed the music—Lulli, an Italian. Previous to that, Cardinal Mazarini, whose name was abbreviated and is more frequently pronounced in its French form, had introduced some Italian operas in France; and long subsequently Piccini was invited to Paris to compose operas, and to stand at the head of the most important and significant controversy on the merits of the musicianship of two nations, and to arbitrate the taste of the Parisians. There was then founded the Paris Conservatoire, of which Paer, an Italian, was the first principal, and Cherubini succeeded to him. Thus, however great power

the French have had in spreading their principles of taste, they have been modest enough to derive these from whatever good sources they could draw them. The ballets of Lulli were presently extended. Some operas by Cavalli were performed by the French Court, and Lulli composed dances for insertion in them. Then was given to another composer, Cambert, and to a librettist, Perrin, a patent for the performance of operas in the Institution then called the Académie Royale. The King, after two years, withdrew the patent and gave it to his favourite Lulli, who was so great a favourite, indeed, that he was not intrusted alone with musical affairs, but he was appointed private secretary to the King, and held other functions of great importance. Now because the French opera arose from ballet, it has never been entirely exempted from it; and there will be presently occasion to show, how imperative became in the constitution of French grand opera the mixture, or intermixture, of singing and dancing. Lulli's operas consisted of music throughout, either vocal or instrumental.

A great light in Italy, Alessandro Scarlatti, in 1680, produced at Rome his first opera, and this is said to have been followed by 108 others; a stupendous number in sound. But it is to be borne in mind that the operas of that day were neither of the length nor of the elaborate structure of those of later time. There may be dated from this period the twofold school of the French and the Italian opera, with Lulli, the Italian, at the head of the French school, and Scarlatti, the Neapolitan, at the head of the Italian school. But the rest of the world was not entirely inactive in operatic composition up to this time. We find in 1625 a translation of one of Rinuccini's lyrical dramas, "Dafne," set to music by Heinrich Schütz, in Germany, but it appears to have been a solitary work. About the same period Nicolo Laniere, an Italian, settled in England, and wrote music to a masque by Ben Jonson, which music comprised the entire of the text. This masque, however, like those first Italian attempts, was not aimed at public performance, but was privately represented in the court of Charles I., by persons of the highest social condition.

Very much to do with the growth of this declamatory style of music must be considered the cantata, of which Carissimi, in the first instance, produced many remarkable specimens. The cantata was at first a term applied to compositions for a single voice, which had an intermixture of recitative—that is, musical declamation with rhythmical melody. After Carissimi, Stradella, Francesco Rossi, and others obtained great distinction in the composition of cantatas. The word has now come to have a different application, but such was its original meaning. These declaimed pieces were always of a dramatic character, although they were monologues. There are in the spoken drama instances of pieces that are entirely monologue;

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and there was in the latter part of the last century a fashion in Germany for such monologues interspersed with music that aimed to illustrate the passions set forth in the text, and this music would either separate the sentences after the manner of interludes, in what we call accompanied recitative, or sometimes very softly accompany the spoken declamation. These monologues would not bear the name of cantata, which of course signifies "sung," but they are the spoken analogy to the cantatas of Stradella, Carissimi, Durante, and persons of that class.

Let us now turn to the opera in England. It is a remarkable and an important fact that the first opera in England was represented in the time of the Commonwealth, in 1656, by the express licence of Cromwell granted to Sir William Davenant, for performance in Rutland House, Aldersgate, of an opera in five acts, called the "Siege of Rhodes." The libretto of this is extant, but unluckily none of the music. The title-page states that each act was set to music by a different composer, and this opera was throughout, from first to last, entirely sung. Besides that this was the first English opera, there is another remarkable circumstance connected with it, that in the principal character, Ianthe, the first female performer that ever was heard upon the English stage sustained a part—Mrs. Coleman, the wife of Dr. Coleman, who composed the music of one of the acts. Thus, from the Puritan time in England dates the opening of the English opera, and that very important introduction into musical performances, the beautiful sound of the female voice.

Directly after this appears Purcell on the scene. In his youth—nay his youth was all his life; he died young, but he was in freshest blossom throughout his entire career—but in his earliest days he wrote an opera, "Dido and Æneas," which was on the Italian and French model, being entirely sung throughout. Later he wrote for the public theatre ("Dido and Æneas" having been composed for a private school), and then the so-called operas were spoken dramas interspersed with music. In this fact I think there is much to be regretted for the art, since, whenever there is in the scanty materials afforded him any opportunity for dramatic painting for personal characterisation, or for illustration of the scene, he grasps this with a master-hand that might well have manipulated the materials of an after-age. He was closely hampered by principles enunciated by the chief dramatic poet of the time, Dryden, who alleged that on the stage the use of music should be limited either to mythological beings or to supernatural agencies; and thus, in the so-called operas of Purcell, either enchanters, or spirits, or gods, or goddesses, or as a great stretch of the supernatural, mad men and women, are the only persons who appear as singers. Thus in the operas on the

story of "Don Quixote," the scene "Let the dreadful engines," and the scene "From rosy bowers," are assigned respectively to the poor girl who has gone mad for love, and to Cardenio, whom Don Quixote encounters in his phrensy among the mountains.

Shortly after the time of Purcell's birth, but contemporaneously with his later writings, appeared in Germany a most important hero in our history, Reinhard Keiser, who produced an immensely large number of operas, which had very great success, firstly in Hamburgh and subsequently in Berlin. In Hamburgh he directed the theatre, and as director he engaged Handel to play in his band, in the early youth of that musician, who, while holding his place among the second violins, still had opportunity to convince the world of his dawning powers as a composer, for there in Hamburgh he wrote his first operas.

The principle upon which the opera had first been instituted now began to degenerate. The art of the singer had greatly advanced. The power of execution, of rendering florid passages with a volubility that seems now almost incredible, since all but unattainable, made it necessary that the composer of an opera had to insert pieces for vocal display rather than for dramatic propriety; and one finds in the operas of the period that the entire action is carried on in recitative, and this action is interrupted by songs where the personages have to stand and either address the audience, or address one another, while if other persons have to listen there is the exceedingly difficult task of filling out the scene where they have no words and no notes to utter.

The opera now became more and more artificial. The songs or arias were arranged in five express classes. There was the aria *cantabile*, which was for the most part a grand pathetic adagio, containing very much florid ornament, but rather as a grace than as matter of continuous execution. Then there was the aria *da portamento*, which corresponded to a great extent with what is now understood by a cavatina. Then the aria *di mezzo carattere;* then the aria *parlante*, and in this one had scarcely ever more than a note to a word, and it approached more to the character of declamation than any of the other classes; and lastly the aria *di bravura* or *d'agilità*. It was required in an opera that every character should have two specimens of each of these five arias, that no two of the same class should ever come in succession, and that each act must have its aliquot portion of the sum total. Thus it will be readily seen that the dramatic action was a matter secondary to the exhibition of the five different qualifications of a singer, and the story of the drama was of minor matter to a vocal display.

We find in Handel, and in others whose names pale under the brilliant lustre of his, the power of dramatic characterisation.

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We find a different class of music and form of phrase and idiom assigned to the several personages in his drama; and we find this, which seems to me to have been a new element at his time, for I have not been able to trace it earlier, combining several personages with their individual characters in one composition. Thus, in "Acis and Galatea" there is a trio, where two lovers utter their words of tenderness to one another, while the Cyclop expresses his rage that Acis stands between him and the gratification of his monstrous love. There is in "Semele" a quartet where the four personators are strongly individualised. There is in "Jephtha" a quartet and quintet; in the quartet especially there is the anguish of Jephtha that he must sacrifice his child, there is the anger of his wife that her daughter should be torn from her, there is the devotion of Iphis who feels that she is fulfilling a divine duty in becoming the willing victim of her father's oath, and there is the betrothed lover of Iphis grieving at the prostration of his fondest hopes; and all these characters are personified, each in a separate and distinct phraseology, and they all sing together. Now in this quality, first of all, of giving different characters to different persons, and in combining in one performance in simultaneous action these several characters, I feel that dramatic music excels every other class of vocal composition. We may talk of the sublimity of the oratorio, and in so far as the oratorio is based upon sublime subjects its expression of the subjects may be sublime. But the dramatic oratorio is capable of all the sublimity which can be infused into didactic oratorio, and it can have this great quality of personification at the same time. It is to be regretted that such rarely occurs in the structure of oratorios, but where it does so occur it gives a most valuable resource to the composer, and opens to him a rich field for musical expression.

We will now advance to the period of Gluck. He began his career as a writer of Italian operas. On this Italian modern (for then it was modern) model he recited the whole story in what they call the "dry recitative" (*recitativo secco*) or recitative, accompanied only with the harpsichord and with the bowed instrument to sustain the bass note, and interspersed this with one or other of the five classes of aria. He attained great celebrity, in consequence of which he was engaged to write for the King's Theatre in London. Here he supposed that, his works being unfamiliar, a pasticcio would supply all that was necessary, and therefore his opera, "La Caduta de' Giganti," was a collection of pieces from several of his other operas adapted to a new text, and the work produced small effect. This brought upon him the conviction that music, to fulfil its highest functions, must be written for and written to the situation in which it was presented; that an adaptation of old music to new words or new words to old music misrepre-

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sented both, and that the true dramatic qualities could only be fulfilled if words and music were written for each other, and when these both belong to the situation to which they were designed. Such indeed was the idea which had been germinated by the Florentines in their institution of recitative and thence of the opera. Such had been set forth at length by that distinguished Venetian amateur, Benedetto Marcello, who in 1720 published an essay on dramatic music, "Il teatro alla modo," in which he satirised the vices of the dramatic music of the time. It became, hereafter, the province of Gluck to put the theory of Marcello into practice. Gluck, for many years, pondered this new view, although in its novelty it was but a revival of the treatment of the dramatic element in music. He met with a poet, Calzabigi, who entirely agreed with him in this perception of dramatic propriety, and wrote for him and with him, and into his very thoughts, the text of the opera of "Alceste."

This was produced in Vienna, in 1767. It was an extraordinary change from what had been heard before, and it met with very great success. In consequence of its success Gluck thought that still higher things were possible to music than were accomplished in it. He knew of the very great resources of the Paris theatre, beyond those in any other capital; he knew the great powers of scenic effect, and he knew how all the accessories then incident to the stage were to be met with in Paris. He went thither for the sake of extending his practice in the composition of opera, and he brought there forward his opera of "Iphigénie en Aulide" with success, which fully realised all his desires. But there he was bound by the exigency of the French opera of intermixing with his music very much dancing. He met with the famous Vestri, another instance of French recourse to Italian genius, for although the French is the dancing nation of all the world by universal admission, this great Vestri, who bears the title in French annals of "Le dieu de la danse," was Italian born, and added the "s" to the end of the name only after he had been some years settled in France. When then "Iphigénie" was to be produced, he went to Gluck to make arrangements for the ballet. He said he must have his *gavotte*, he must have his *Allemande*, he must have his *bourrée*. Gluck exclaimed, "Agamemnon never danced a *gavotte!*" Vestri replied, "So much the worse for Agamemnon; the people of Paris cannot witness an opera without one"; and consequently such dances were necessarily inserted into the drama, which represented the woe of Agamemnon when he must kill his daughter, in order to propitiate Diana for fair winds to carry the Greeks to Troy.

We find in Handel the representation of several characters contained in one piece of music, but they have still this stagnant quality of singing so many asides together, and never address-

ing one another. A composer who is only known by name, for I have never been able to meet with any specimen of his works, Logroscino, is said to have, in some operas he wrote for the small theatre in Naples, represented continuous action in music, and to have had great success. Nicolo Piccini, afterwards the rival of Gluck in the great Paris musical warfare, extended the idea, and in his opera of "La buona Figliuola" there are specimens of long-continued music during a varied action, where the characters address one another, where sometimes each sings his own sentiment aside while others sing theirs, and where this particular element in lyrical composition is brought to a very high standard. This opera was set to a text which was founded on our Richardson's novel of "Pamela." The opera had an immense success, and, in consequence of it, Piccini's fame was very greatly extended.

The particular combination of characters and continuation of action has its highest example in the masterpieces of Mozart, and we need but refer to the great finale of "Don Giovanni," to the finale of each act of "Figaro," and to the sextet in the second act of "Don Giovanni," to perceive the utmost to which the dramatic musical art has yet attained; the utmost to which it seems possible human genius can ever reach. The only probability that dramatic music may exceed these examples may be in the choice of a loftier subject than the gallantries of Don Giovanni and the intrigues of the Count's valet in "Figaro." But with the application of such resources to a great tragical or a great religious subject, the opera is capable of becoming the greatest development of the musical art. It is especially to be noticed, in these works of Mozart, that all the principles of musical construction are manifestly fulfilled, and that while they illustrate the action, while they express and declaim the text, the musical composition is in itself so complete and so perfect that were the words withdrawn we should still be delighted to hear the music; were the action imperceptible, one still would feel his musical sense satisfied in the admirable pieces which these works present to it.

I have now to speak of a particular quality in dramatic composition that is much vaunted of late as a novelty of one composer, and has been characterised by the German term of *Leit-motif*. The rise of this may grow to an abuse, and one must bear in mind the remark of one of the humorous journals on some more or less recent performance of the kind, that the Portuguese proverb Byron quoted may be applied to some of the works in question, and we may say that "Valhalla is paved with good motives," and those motives are not always realised. One finds a particularly strong anticipation of this allusion to a musical idea that has been previously stated in the first finale of Beethoven's "Fidelio." In the scene in this

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opera where the governor of the prison, Pizarro, requires Rocco, the jailer, to fulfil his dreadful purpose upon the prisoner Florestan, he has described the contemplated murder, and, after exclaiming, "Ein Stoss," sings to four notes, with terrible emphasis, "Und er verstummt." In the finale, Rocco is pleading for the prisoners to be allowed to range the prison-yard, and enjoy for the first time the fresh air of heaven. Pizarro is angered to find them at large, and demands how has this man dared without order to set them for awhile at liberty? No word is in the text replied; but in the orchestra are those four notes by which we read the conscience of Pizarro—that he feels he has confessed his intention to murder his victim—that he has made this man his confidant, and of course, as he has made him his confidant, he cannot deny him the privilege which he has used of giving the prisoners a few moments of freedom.

The same appropriation of a musical idea to the constant expression of one speciality may be noticed in the "Freischütz" of Weber, where the influence of the evil spirit is always indicated by that particular *tremolo* with the soft note upon the drum, together with the *pizzicato* for the basses. Again, in his "Euryanthe," by that peculiar passage which occurs in the centre of the overture in slower *tempo* than the rest of the movement with muted violins, which is always used in the opera when allusion is made to that ghost story, which is the means employed to injure the character of Euryanthe. Let us look further: there is scarcely to be met with in an Italian opera a mad scene, where the *prima donna* lets down her back hair, but she is sure to sing some portions of the love duet she had with the tenor in the first act. And in all the operas of this century, where it has been found convenient, is displayed a natural, but not a slavish use of this resource.

The resource is not confined to dramatic music. It may be said to be an application of the same thing, that in setting even music for the Church the recurrence of a musical idea at a later portion of the text, which idea was previously heard with other words, is employed by the composer to throw the light of that former text upon the latter expression. Thus, for instance, we find in some settings of the canticle "Te Deum" that when in the latter portion of the hymn the words come, "Day by day we magnify Thee," the same musical phrase is appropriated which is set to the words "We praise Thee, O God." To magnify, to praise, are one outpouring of the heart; and the sense of this magnifying and worshipping, in the latter portion of the hymn, is aggrandised and made more forcible by such musical reference to the corresponding words at the outset of the canticle. And in such manner as this the principle of recurrent musical ideas is to be used, not as a pantomime trick of bringing up a stage goblin, but as a very

high medium of enforcing the musical meaning. Further it is not confined to vocal composition alone, but I maintain that in the Symphony in C minor of Beethoven, when in the last movement the theme of the scherzo recurs, this is quite as much an application of the principle of the *Leit-motif* as anything that has occurred in recent operas. This is to recall in the midst of the grand heroic movement whatever sentiment the composer designed to express in the music of the scherzo; and this was not original in Beethoven, because in a Symphony of Haydn in B, which is very little known, in precisely the same manner, and in precisely the same situation, namely, in the middle of the last movement, there occurs a phrase from the minuet of the same symphony.

Again, in the first quartet of Mendelssohn for violins, at the end of the last movement occurs that lovely melody in E♭ which opens the first movement. In the second quartet he begins with the melody, which he had previously set to words, and the reference to which setting is a very strong index towards comprehending the expression intended by the whole quartet, and the quartet terminates with the same song set forth at length which is only hinted at in the beginning. That is the Quartet in A minor. Then again, in his octet, there recurs in the midst of the last movement a portion of the scherzo which is interwoven with the themes of the last movement, most ingeniously combined, and the one is made to form a counterpoint to the other. Here again we find this application in instrumental music of the element that I think is very valuable, but by no means a recent acquisition in the operatic treasury.

We have to distinguish now between what the French call their grand opera and their comic opera, understanding that the term comic does not signify as in ordinary speech matter for jest and laughter and fun, but the comic opera corresponds with what was here called the ballad opera, or the opera of the days of Purcell; an opera, namely, in which there is song, but in which much is spoken. And this has in France a very curious origin. A patent for the performance of the lyrical drama was granted specially to the Académie Royale. It was therefore forbidden to sing on the stage of any other theatre. There were, however, performed at the Opéra-Comique spoken dramas, which were interspersed with songs; these songs were set to popular tunes, and when the situation for their insertion occurred a scroll was displayed, on which the words were written at length and in large characters; the band played the tune and the audience sang the song. From this has been developed the Vaudeville, and thence the Opéra-Comique of the French stage.

Corresponding with the Opéra-Comique, which has—more than our ballad operas possess—some occasional largely

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developed pieces, is the "Sing-Spiel" of the German stage, and it is to be remembered that it has been so highly developed that many of the best works in the German school are of this structure. Such are the "Seraglio," the "Zauberflöte" of Mozart, the "Freischütz" of Weber, the "Faust" of Spohr, and many others which might be named.

It is in the last fifty years only that the composition of the highest class of opera has been aimed at in England; and although we have lost some of our dearest friends who have had best successes in this department, there are still some who aim at dramatic composition; and let us hope that they will have the opportunity, as no doubt some of them may have the talent, to add yet glories to the lyrical drama. I would lastly remark that the sunshine of the poet draws from that great ocean, the musician's mind, the clouds which reflect its light prismatically broken into countless colours, and which pour their riches upon the earth to warm, and strengthen, and nourish men's hearts with the wealth of harvest—the harvest of the human mind.

The CHAIRMAN said that at that late hour he would not occupy their time, but the very first thing he would ask them to do would be to accord a hearty vote of thanks to Professor Macfarren, which he was sure they would do with pleasure, for the admirable and splendid *resumé* and history of the lyrical drama which had been given from its earliest period down to the latest development. He was sure that all present had listened to it with interest and instruction, and he only regretted that the time had so far advanced as to preclude any lengthened observations on the subject.

The resolution having been carried,

The CHAIRMAN said he hoped that during the next session Professor Macfarren might favour them by coming forward again and taking up this theme and continuing it, not perhaps at so great length, but in order to give them an opportunity of asking him any questions, and thus illustrating the subject still further.

Professor MACFARREN briefly acknowledged the compliment, and the proceedings terminated.

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